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THE ACTIVITIES OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS DURING THE PAST TWENTY-FIVE YEARS

By CHAS. WARREN HUNT,
Secretary, Am. Soc. C. E.

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AMERICAN SOCIETY OF CIVIL ENGINEERS

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PAPERS AND DISCUSSIONS

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THE ACTIVITIES OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS DURING THE PAST TWENTY-FIVE YEARS

By Chas. Warren Hunt, M. Am. Soc. C. E.

Presented December 5th, 1917.

In 1897 a "Historical Sketch of the American Society of Civil Engineers" by the writer was published by the Society. This was issued in book form only, and a limited number sold, the proceeds being turned over to the Building Fund for the Fifty-seventh Street House. At the Washington Convention, in 1902 (the Fiftieth Anniversary of the Society), he briefly sketched the development of the intervening years. These, so far as known, form the only attempt at a connected account of the activities of the Society.

During the past quarter century many things have happened, and much has been accomplished of which there is no convenient and readily accessible record. It is true that much material, in a more or less fragmentary form, may be found scattered through the 250 monthly numbers of *Transactions* and *Proceedings* published during that period, but, even if they are all accessible in bound form, more effort and time are necessary to get at the facts than the busy engineer can afford.

In addition to this, the growth has been so rapid that only 646 (about 7½%) of the present membership of 8 544 were connected with the Society at the beginning of this period. It should be remembered also that the rate of increase in membership has been so much greater during the latter part of this period, that 5 137 (more than 65% of the increase) have joined within the last ten years.

With full recognition of the fact that statistical matter and figures are more useful in a printed than in a spoken record, it is intended to place before you this evening as briefly as possible the things which appear to be most interesting, and of which the membership in general has little if any information.

Early History.

The American Society of Civil Engineers was inaugurated at a meeting held in the office of the Croton Aqueduct Department, Rotunda Park, New York City, on Friday, November 5th, 1852. At this meeting 12 Engineers were present. Alfred W. Craven, Chief Engineer of the Croton Aqueduct, presided. The first Constitution (adopted December 1st, 1852) declared the object of the Society to be:

"The professional improvement of its members, the encouragement of social intercourse among men of practical science, the advancement of engineering in its several branches, and of architecture, and the establishment of a central point of reference and union for its members."

The circular issued at that time stated:

"Civil, geological, mining, and mechanical engineers, architects, and other persons who, by profession, are interested in the advancement of science, shall be eligible as members.

"It is anticipated that the union of the three branches of civil and mechanical engineering and architecture will be attended by the happiest results, not with a view to the fusion of the three professions in one; but as in our country, from necessity, a member of one profession is liable at times to be called upon to practice to a greater or less extent in the others, and as the line between them cannot be drawn with precision, it behooves each, if possible, to be grounded in the practice of the others; and the bond of union established by membership in the same Society, seeking the same end, and by the same means, will, it is hoped, do much to quiet the unworthy jealousies which have tended to diminish the usefulness of distinct societies formed heretofore by the several professions for their individual benefit."

The first professional meeting was held on January 5th, 1853. During 1853 and 1854, fourteen meetings, with an average attendance of six, were held, all in the office of the Croton Aqueduct Department. There is no record of any meeting after that of March 2d, 1855, at which the question of the securing of quarters was considered and the Society adjourned, until October 2d, 1867, when a meeting was held at the office of C. W. Copeland, 171 Broadway, New York City, at which the

HOUSE OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS
1897–1917

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Minutes of the Meeting of March 2d, 1855, were accepted, and the object of the meeting stated to be "to take such steps as might be necessary to resuscitate the Society."

Society Headquarters.

The result of this was that the first home of the Society was in rooms in the Chamber of Commerce Building, 63 William Street, New York City, where the First Annual Meeting was held on November 6th, 1867.

In 1871 the quarters in William Street were enlarged by the renting of additional rooms, and on May 1st, 1875, new quarters were secured on the southeast corner of Broadway and Twenty-third Street.

On May 1st, 1877, the Society moved into a house, No. 104 East Twentieth Street, which it rented.

In April, 1881, a dwelling house, No. 127 East Twenty-third Street, was purchased, the first meeting being held there on May 4th, 1881, and it is of interest to note in passing that one of the Founder Societies—The American Institute of Electrical Engineers—came into being at a meeting held in that house on May 13th, 1884.

This house was occupied until 1896, when two lots, Nos. 218 and 220 West Fifty-seventh Street, with a total frontage of 50 ft., were acquired, and building operations started in December, 1896, in charge of a Building Committee consisting of George A. Just, Charles Sooysmith, Bernard R. Green, George H. Browne, William R. Hutton, Joseph M. Knap, T. C. Clarke, and Chas. Warren Hunt.

The new house was completed and formally opened on November 24th, 1897.

Owing to the growth of the Society, an additional 25-ft. lot, immediately adjoining the Society House, was purchased in 1904, and a 50% addition to the house was built. This addition was completed in the latter part of 1905, and was first used at the Annual Meeting of January 17th, 1906. The Building Committee in charge of this work consisted of Alfred Noble, S. L. F. Deyo, Nelson P. Lewis, and Chas. Warren Hunt.

The Society property then consisted of a plot of 75 ft. frontage on Fifty-seventh Street, varying in depth from about 107 ft. on the east, to about 117 ft. on the west. The House was a 4-story and basement, fireproof structure, the two lower floors covering the entire plot, and the two upper floors only the front portion. The first floor contained a

spacious foyer and three offices, one of which was used for the office of the Secretary. There was a large room in the rear called a Lounging Room, its use being principally for informal and social meetings. The main stairway gave access to the second floor on which there were in the front a large Reading Room, and in the rear an Auditorium with a seating capacity of 500. The third floor was devoted entirely to the office force, and the top floor to a double tier of book stacks with sufficient capacity for about 150 000 volumes, and with space for considerable enlargement. The building was a dignified and commodious one, and, having been specially designed for the use of the Society, proved itself adequate in every way, and, with certain additions which could have been made at any future time for the increase of space available for office and stack-room purposes, undoubtedly would have been ample for the use of the Society for many years to come. The total amount expended by the Society for the lots and building was, in round numbers, $360 000.

In February, 1903, Mr. Andrew Carnegie offered to give $1 000 000 to erect a suitable union building for the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Institute of Electrical Engineers, and the Engineers Club. This offer was very carefully considered by this Society, and submitted to a referendum vote of the entire Corporate Membership, the arguments for and against its acceptance being set out in an impartial manner. The result was that the membership decided, by a vote of 1 139 to 662, not to accept the offer.

The other organizations mentioned accepted. The amount donated by Mr. Carnegie was increased to $1 500 000, the result being the Engineering Societies Building, Nos. 29-33 West 39th Street, and the Engineers Club, 32 West 40th Street. The fund was divided as follows: to the three Engineering Societies, $1 050 000, to the Engineers Club, $450 000.

In 1914 the entire property of the United Engineering Society consisting of a structure of thirteen stories, built with the funds provided by Mr. Carnegie on property purchased by the three Founder Societies, had been cleared of debt.

There was, however, a strong feeling among those prominently identified with the activities of the three Founder Societies that this build-

House of the American Society of Civil Engineers
220 West Fifty-seventh Street
1897–1917

ing could not be considered a strictly representative Professional Headquarters until it housed also the oldest of the National Societies.

After several preliminary discussions of the matter by individuals, on June 9th, 1915, an informal meeting of members of all the National Engineering Societies interested in the question of co-operation of the various branches of the Profession was held, and, as a result of this meeting, the matter was taken up by the Board of Direction of this Society, and Clemens Herschel, Robert Ridgway, and Chas. Warren Hunt, were appointed a Committee to consider the question of a possible amalgamation in an Engineering Headquarters. Charles F. Loweth, Hunter McDonald, George F. Swain, and John A. Ockerson were subsequently added to this Committee, and the Board of Direction, under date of February 1st, 1916, laid the whole matter before the Corporate Membership of the Society for a referendum vote. The letter-ballot on this question was canvassed on June 15th, 1916, the result being 2 500 in favor of the acceptance of the offer of the three Founder Societies to 390 against it.

This offer, briefly stated, was as follows:

That a three-story addition be made to the Engineering Societies Building at a cost estimated at $225 000, and not to exceed $250 000. That the American Society of Civil Engineers should pay for this addition, if the cost did not exceed the latter figure, but that if that cost exceeded $250 000 the additional expense should be borne by the United Engineering Society. That the American Society of Civil Engineers would then become an equal owner in the whole enlarged property on the same terms as each of the three original Founder Societies, and would occupy as much space as it might need on two of the additional floors.

Immediately afterward the Board of Direction accepted in due form the invitation of the Founder Societies in behalf of the Society, and Clemens Herschel, J. V. Davies, and Chas. Warren Hunt, were appointed a Committee with power to carry out the agreement.

This agreement was ratified at a meeting of the United Engineering Society on August 10th, 1916. Work was begun on the necessary preliminary structural work on August 1st, 1916, under the supervision of a Building Committee consisting of one representative from each of the Founder Societies as follows: H. H. Barnes, Jr., E. Gybbon Spilsbury, Chas. F. Rand, and Chas. Warren Hunt.

Owing to the general conditions of labor and material, the cost of the addition to the building, which it was thought in 1915 was amply provided for, with all contingencies taken care of, in the estimate of $225 000, was found to be at least $50 000 in excess of the limiting figure, or $300 000. This additional cost has been borne equally by the four Founder Societies.

The total share of this Society, therefore, has been $262 500, which, together with certain additional expenses in fitting up the new quarters, cost of new furniture, and moving, will bring the total expense of our change of headquarters to approximately $280 000.

The addition, as before stated, consists of three stories. The fourteenth floor will be used as a stack-room for the United Engineering Library, headroom for a double tier of stacks having been provided. A report of the writer to the Board describes our new quarters, as follows:

"The lay-out of the floors to be occupied by this Society was made by the writer with a view to utilizing every available foot of space and to secure good light. This was the more necessary inasmuch as the floor area of these two floors is much less than that of the lower floors.

"Briefly, the Society will occupy the entire 15th floor, and about two-thirds of the 16th or top floor. In all there are eleven main rooms. On the 15th floor there are:

"(1) The office of the Secretary, entrance to which is at the right of the elevators.

"(2) The Reading Room, directly opposite the elevator, the entrance to which will be the main entrance to the Society Rooms. This room is 51 by 26 ft. and looks out over Bryant Park to the north. It is panelled in oak, and when used by our members, in connection with the Library, will, it is believed, practically take the place of the old Reading Room in Fifty-seventh Street.

"(3) The Board Room. This room, which is 43 by 24 ft. is on the south side of the building, directly opposite the Reading Room, a 6-ft. hallway separating them. This room is panelled in mahogany, and the furniture for it, which has been specially designed, is also of mahogany, and consists of 4 tables and 30 chairs. The tables are designed so that they can be placed together making a table 24 by 6 ft., or can be separated and used as units 6 by 6 ft.; and, when necessary, can be made into tables 6 by 3 ft. to set against the wall and take up very little room. In the partitions between these rooms and the hallway, two 8-ft. openings, opposite each other, with sliding doors, have been arranged, so that the two rooms can be thrown together, practically forming one large room averaging 57 by 47 ft.

ENGINEERING SOCIETIES BUILDING
33 WEST THIRTY-NINTH STREET

"(4) General Office. A large room covering the east side of the building, 59 by 37 ft. Here will be located the general office force. A service stairway, which will practically be a private stairs for this Society, gives access to the 16th floor, where, on the east side of the building, there are four small offices, one of which (5) is to be used as a Rest Room for women; (6) for the Bookkeeper; (7) Editorial Department; (8) Applications Department. Three other large rooms are available for Committee Rooms, or whatever use may develop in the future. They are (9) 24 by 20 ft., (10) 22 by 24 ft., (11) 36 by 23 ft.—these figures being approximate.

"A doorway in the hall separates that part of the 16th floor to be used by the Society from three rooms which are available for renting by the United Engineering Society, and to which access is obtained through the elevator and hallway without passing through the quarters of the Society."

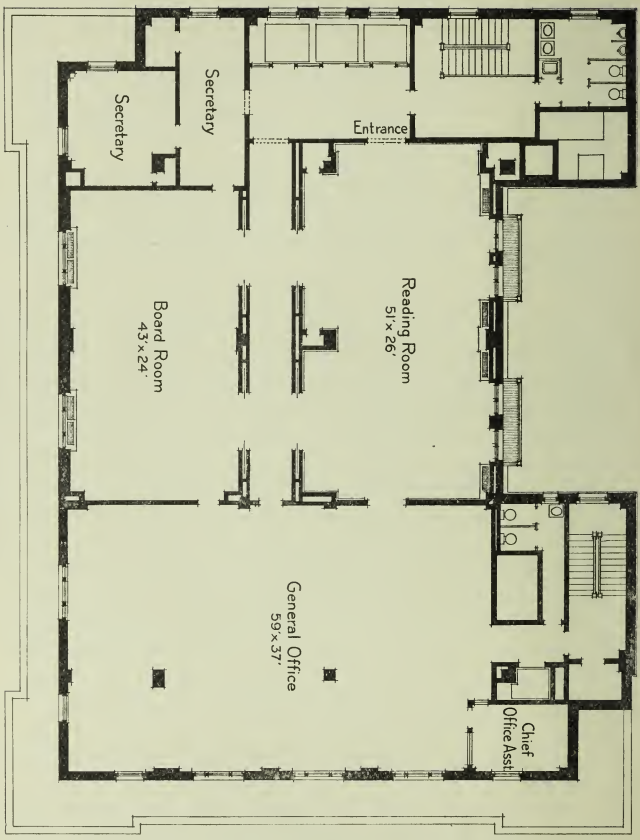
Library.

Immediately after the foundation of the Society, on January 5th, 1853, a circular was ordered to be forwarded to "All men in charge of public works, asking for printed reports, maps, plans, etc., in order to start an Engineering Library in connection with the Society." There is no record as to the response to this circular, but, naturally, very little in the way of a Library could be secured until some place was provided in which the books could be cared for, and it was not until headquarters were first established, in 1867, that the Library really had a start. After that its growth was quite rapid, when one considers that practically no books were purchased, the accessions being entirely the result of donations. Several large additions were received in the succeeding years notably, in 1872, one from William Young Arthur, M. Am. Soc. C. E., and in 1873 one from William J. McAlpine, Past-President, Am. Soc. C. E.

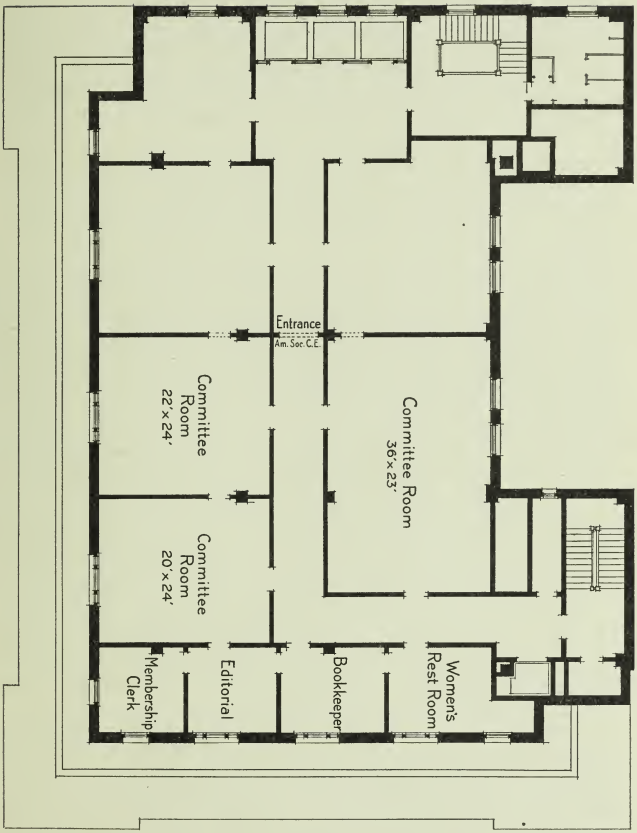
The Annual Report of the Board of Direction for 1873 gave the total contents of the Library as 3 433.

In 1873 a special committee was appointed, under the following resolution:

"Whereas, the foundation of a library and museum, which contains within itself all accessible published matter relating to the history, theory and practice of engineering, the construction and management of public improvements, and the methods and cost of manufacturing operations, with illustrations by models and samples of the results thereby obtained, must be invaluable, not only to the profession, but



AMERICAN SOCIETY OF CIVIL ENGINEERS
ENGINEERING SOCIETIES BUILDING, FIFTEENTH FLOOR



American Society of Civil Engineers
Engineering Societies Building, Sixteenth Floor

to all who are interested in the pursuit or the application of practical knowledge,

"Resolved, that a Committee, consisting of the President and nine other members to be named by him, with power to fill vacancies, be appointed to devise a plan whereby such a library and museum may be founded; the funds obtained for its collection, management, increase and maintenance; a suitable place secured, where it and other possessions of the Society may be preserved and its advantages enjoyed by members and others connected therewith, irrespective of their location; * * *"

This Committee did not make a report until 1875, and it seems worth while to quote its principal recommendations, which, it is submitted, are wonderfully comprehensive, and cover the ground as thoroughly as if they had been written to-day.

"The library of the American Society of Civil Engineers should contain the literature of rational and applied science, constructive art and technology; all that has been, or may from time to time be published, relating to the history and prosecution of engineering; the maps and profiles of every canal and railroad, their complete reports, and those of municipal and state departments; descriptions of private and miscellaneous works; statistics of the material resources and development, the wealth, manufactures and commerce of countries; standard works of reference in science and art, and lack nothing published anywhere, in our own or other tongue, that in a library may aid the student or accomplished engineer seeking professional knowledge. * * * * * * Much professional knowledge recorded in the several technical journals of the day, is almost inaccessible to the busy members of a profession which allows but little time or opportunity for exhaustive reading. Complete treatises on theoretical or practical subjects, frequently published and full of matter valuable to engineers, are neither purchased or read by them. These, as issued, should form a part of the library, and its advantages be placed at the command of all connected therewith, wherever they may happen to reside, so that at their request, complete examinations on specified topics can be made, pertinent extracts copied, and proper references given.

"The plan here outlined involves the preparation of concise abstracts of new works, reports, scientific and technical journals, proceedings of societies, and other publications, as received; the whole to be classified and indexed, that a busy man may quickly learn, without the trouble and expense of looking over the vast amount of matter now published, to determine for himself, whether there has recently appeared in print anything referring to a particular subject. A serial index of current engineering and technical literature as thus described, can be comprised within a few pages issued weekly or monthly, and

would largely facilitate the dissemination of professional knowledge 'among men of practical science'.

"A skillful librarian, who knows what the library contains, and where it is to be found, can at the mere cost of the time spent, make exhaustive researches on a topic, for members, quicker and with greater thoroughness than they themselves can do it. Any one who has consulted large libraries knows that, generally, more time is spent in learning how and where to look, than in the work at hand."

In 1885, a strong effort was made to form a library for the joint use of the Civil, Mechanical, Mining, and Electrical Societies, and a committee was appointed by this Society to confer with similar committees from the other Societies; but, nearly three years later, the Chairman reported that no satisfactory progress had been made in the matter, and no further action was taken.

At the beginning of the twenty-five year period under consideration the Library had, all told, about 16 000 accessions, and five years later. when it was moved to the Fifty-seventh Street House, it contained approximately 22 000, among them being many old and rare volumes. Up to October 1st, 1916, when the Library was turned over to the United Engineering Society, the average yearly growth was 3 000, and the total number of accessions had increased to more than 89 000. More than 67 000 of these were not duplicated in the combined libraries of the Mining, Mechanical, and Electrical Societies, and these were turned over to the United Engineering Society in October, 1916. In addition, the book-stacks which had been erected in the Fifty-seventh Street House, and provided for additions to our library for many years, were donated to the United Engineering Society. They have been taken down, and are now being erected in the new "Stack Room" on the 14th floor of our new home.

The remaining 22 000 volumes have been presented to the Cleveland Association of Members. The collection is to be kept intact, and is now temporarily in the custody of the Cleveland Public Library.

In the Fifty-seventh Street House provision had been made for a commodious, up-to-date Stack Room, and, immediately upon moving in, a thorough re-classification and indexing of the Library was undertaken. The Library at that time was in an exceedingly chaotic state. No systematic index for it had ever been made, and it was a problem how it should be made efficient and available for the use of Engineers. The task fell upon the writer, and he made every effort to find out just

what had been done up to that date in the classification and cataloguing of an Engineering Library, by inquiry from available sources. A composite picture of the replies received would have read somewhat like this: "We use such and such a system, and we advise you not to." Under this condition he was thrown entirely on his own resources, and the classification which has been in use for 20 years (it is still used so far as our books, which have been transferred to the United Engineering Library, are concerned), was worked out.

In such a pioneer effort by one who, up to that time, had a very limited knowledge of Library work, it is not surprising that there were many imperfections. On the other hand, it was put together from the standpoint of an Engineer, and experience has shown that it has been a most efficient tool. This classification was used, not only to arrange books on the shelves, but also to arrange cards in the Catalogue. Many of the classes were very large, and were not sub-divided closely, and therefore the "Class Catalogue" was supplemented by a "Subject Catalogue" in which the cards were arranged alphabetically by subject. At least one card was written for every book in the Class Catalogue, and as many additional cards were placed in either the Class or Subject Catalogue as was necessary to cover its contents fully. All books were very carefully analyzed, cards being written for any sections or chapters which would be of special interest, which necessitated in some cases as many as 40 or 50 cards for one book. In addition to the two Catalogues described, there was also an "Author Catalogue" in which at least one card was filed for every book in the Library.

In 1900 the Classified Catalogue was printed and issued in a volume to all members. This book contained 700 pages, and covered about 32 000 titles. Its issue stimulated the growth of the Library to such an extent that two years later a second volume of 293 pages was issued, bringing it up to date.

During the years in which this classification was in use much experience was gained, and toward the latter part of that period an improved and extended classification was worked out by two members of the Library Staff, Miss Eleanor H. Frick, and Miss Esther Raymond, on their own initiative, and largely in their own time.* Though this classification is based on the general ideas of the writer, full credit for the work belongs to the Librarians mentioned. It is believed that the

* The two classifications are given in Appendices A and B.

publication of these two classifications will be of considerable use, not only to Technical Libraries, but to members of the Profession. As an instance of such use, it may be stated that the Committee of the Engineering Council charged with tabulating the members of the Society available for special work in connection with the War, used this classification in making up the various headings under which the members of this Society should be indexed.

In 1896, the writer in the "History" previously referred to, speaking of the Library, said:

"While it is not possible now to bring its use within the reach of members residing at a distance, it is hoped and believed that after the new house is completed arrangements can be made by which non-resident members may be able to secure data on any special points at small expense."

As soon as possible after the cataloguing had been completed, he took up the matter, and in 1902 was authorized by the Board to make searches in the Library, upon request, and to charge therefor the actual cost to the Society of the work required. About 1 000 such searches and bibliographies have been gotten out, and there is abundant evidence of the appreciation of our non-resident membership.

A number of years after this system was started, the Library of the United Engineering Society established its Service Bureau, which has been very successful; and, as our Library now forms part of the consolidation, our members will have the benefit of that service.

Local Associations.

The question of the formation of Local Associations of Members in the various centers of population was considered in a general and informal way several times prior to 1905. It was discussed at the Cleveland Convention in that year, following a report from the Secretary stating that a circular note had been forwarded to at least three Members in each of the following cities: Albany, Boston, Cleveland, Chicago, Detroit, Kansas City, Mexico, New Orleans, Philadelphia, Pittsburgh, St. Louis, St. Paul and Minneapolis, San Francisco, and Washington, setting forth the advantages of such Associations, both locally and to the Society as a whole, recommending their formation, and enclosing a draft of a proposed Constitution suitable for adoption. The Secretary reported that considerable interest had been

aroused, and that two Local Associations had been formed, one at Kansas City, Mo., and one at San Francisco, Cal.; that meetings had been held at Washington, Cleveland, Pittsburgh, Boston, St. Louis, and Philadelphia, and that a report from the three Chicago Members had also been received. The reports from Washington, Cleveland, and Pittsburgh, were non-committal. In Boston it was the unanimous opinion of those consulted that it would be very difficult to arouse sufficient enthusiasm; in St. Louis a meeting of 23 Members adopted a resolution to the effect that it was not desirable at that time to have such an organization in that city. In Philadelphia a letter-ballot was taken resulting in a vote of 42 to 14 against the proposition, and the Committee in Chicago was strongly against it.

The general idea of the organization of Local Associations of the Society, suggested by the Board of Direction, was approved by the Convention.

The writer remembers well what a hard struggle it was to overcome the many objections raised, the principal one being the fear that such Associations would injure local societies and clubs already established; but time has accomplished what then seemed impossible, and we now have Local Associations in each of the cities named except Albany, Boston, Mexico, Pittsburgh, and Kansas City. In the last named the first association was formed, but it was not successful. In addition there are 13 others, a total of 21. It is undoubtedly a fact that these Associations add strength to the Society as a whole, and are of great local benefit. Since the above was written, the writer has been informed unofficially of the formation of an Association in Pittsburgh.

An important meeting of the presidents of all the Local Associations was held at the Society House on January 19th, 1915, at which many matters of vital interest to the Society were discussed.

Membership.

Twenty-five years ago the total membership of the Society was 1 609; at the present writing it is 8 544, a net increase for that period of 6 935, the average yearly net increase having been 277. It should be noted that this increase has been in spite of the fact that the requirements have been raised during the period. The writer's opinion is that it is also due to this fact.

Finances.

As nearly as can be determined, the cash value of the property of the Society, at the beginning of the twenty-five year period under consideration, was $60 000. In a statement issued by the Board of Direction in May, 1895, when the building of the Fifty-seventh Street House was first contemplated, the available assets of the Society were given as follows:

House, 127 East 23d Street (estimate)	$60 000	
Mortgage	16 000	$44 000
Securities in safe deposit, par value		16 000
Cash, awaiting permanent investment		4 500
Amount available		$64 500

At the present time a similar statement would read about as follows:

Society House, 220 West 57th Street, cost	$360 000	
Less Mortgage	150 000	$210 000
New 39th Street Quarters, cost to the Society		267 500
Securities in safe deposit		10 000
		$487 500

The assets of the Society on the basis of this statement have increased during the past quarter century about $425 000. This, however, is very conservative, inasmuch as in the above figures the cost of the Fifty-seventh Street property is used, whereas in the statement of 1895 the value of the Twenty-third Street house was estimated, and largely in excess of the price paid for it; in addition to this, the value of the Society's one-fourth interest in the Thirty-ninth Street property is at least $250 000 more than the cost given. It would be more nearly correct, therefore, to say that the increase of property assets during this period has been $700 000.

Meetings.

During the past twenty-five years about 500 regular meetings of the Society have been held. Nearly all of these have been for the purpose of presenting and discussing professional papers and topics, and there have been 20 or 30 extra or special meetings, and about 50 meetings which are spoken of in the Constitution as for "social" purposes. There were also a number of special meetings of the Juniors of the Society.

Among the most notable events, the following might be mentioned:

The formal opening of the Fifty-seventh Street House on November 24th, 1897 was held in the afternoon. The President, Benjamin M. Harrod, of New Orleans, La., presided. The ceremonies were opened with a dedicatory prayer by the Rt. Rev. Henry C. Potter, and addresses were made by Gen. W. P. Craighill, Past-President, J. G. Schurman, LL.D., President of Cornell University, and the Hon. Joseph H. Choate.

On September 16th, 1904, a reception was given to the members of The Institution of Civil Engineers of Great Britain, who were visiting this country by invitation of the Society.

On November 30th, 1910, at the home of the Society, the John Fritz Medal was awarded to the late Alfred Noble, Past-President, Am. Soc. C. E.

On June 3d, 1912, the Society tendered a reception to the Twelfth International Navigation Congress, and on September 5th of the same year to the members of the Sixth Congress of the International Association for Testing Materials.

From 1903 to 1910 all the meetings of the John Fritz Medal Board of Award were held in the Society House, and on many occasions meetings of other societies and associations were held there by special permission of the Board of Direction.

Amendments to the Constitution.*

A revised Constitution was adopted on March 4th, 1891, the principal changes being the provision for two new grades of membership. The class of Associate Member was created, so that it would be practicable to raise the qualifications for the highest grade, and to take

* All the amendments, with a brief statement of their purport and the vote by which they were adopted or rejected, will be found in Appendix C.

care adequately of a certain class of engineers not eligible for the grade of Member, as well as to provide at the proper time a method for advancement to Corporate Membership of those in the old Junior grade who were deserving of such advancement. The requirements for the grade of Junior were lowered so as to bring them within the reach of all young men who at the beginning of their careers wished to be connected with this Society. Provision was also made for an increase in the number of Vice-Presidents and for the enlargement of the Board of Direction, so as to make it more truly representative. The respective terms of office were lengthened, and it was stipulated that members of the Board should not be eligible for immediate re-election, thus securing rotation in office.

The Report of a Committee on Revision of the Constitution, under date of November 5th, 1890, signed by W. P. Shinn, Mendes Cohen, F. Collingwood, and S. Whinery, states in part:

"It was upon the question of the duties, position and standing of the Secretary that the greatest diversity of views was found to exist. A large number of members have expressed the opinion that the Secretary of the Society, like the secretary of an ordinary business corporation, should be appointed by the Board of Direction, but those who so think forget or ignore the fact that, unlike the ordinary business corporation, the offices of President and Vice-President in this Society are of an honorary nature. The homes of these officers are most frequently in parts of the country remote from the Society's place of business, and it may often occur that they can perform but few of the executive duties. In fact the Society does not contemplate that the men whom it honors with such positions shall drop their professional duties to attend to Society work, and it certainly does not propose to pay them for doing so. The executive duties must, however, be performed by some one, and at all times. The Committee has, therefore, distinctly named the Secretary, under the President and Board of Direction, the executive officer of the Society.

"If we stop for a moment to consider the important duties to be performed by such officer, often of a delicate and confidential character, it will be seen that he should have a voice in the deliberations of the Board; for he is the source of all information, and to him must be referred the detailed investigation of every question.

"It is necessary, too, that the office should be filled by a person capable of representing the Society favorably, and deciding properly in the matters constantly arising in the intervals between the meetings of the Board; and this can only be well done by a professional man, of business experience and standing. Such a man cannot be easily

secured for any sum which the Society can at present afford to pay; nor would such a man be willing to sever himself entirely from the field of professional engagement."

Up to 1894 the office of Secretary had been filled by a general vote of the membership, but in that year an amendment was carried placing the election of the Secretary in the hands of the Board of Direction, but otherwise not changing his status. The vote on this amendment was 191 to 6. In 1895 an amendment was carried which divided the territory occupied by the Society into 7 Geographical Districts and provided for representation of each of these Districts on the Board of Direction. The vote on this ballot was 273 to 12.

The revised Constitution adopted in 1891 provided for the election of all members by a letter-ballot of all Corporate Members, 7 negative votes excluding. It also provided that the Board, upon receipt of eight requests for reconsideration of the ballot in the case of any rejected candidate, was empowered to order another ballot to be taken. On this "Reconsideration" negative ballots to the number of 10% of the votes cast were necessary for exclusion.

The small number of negative ballots necessary for exclusion on the first ballot caused trouble by the exclusion of well-qualified applicants; the reconsideration ballot also proved unsatisfactory, for the reason that the number of ballots necessary for exclusion was dependent on an unknown quantity. Under it, a candidate might be excluded with only 15 negative ballots, and another might be admitted with 40 or more negative ballots. In fact, such cases as these actually occurred.

In 1903, the number of negative ballots required for exclusion on the first ballot was increased from 7 to 20. Even this proved unsatisfactory, and in 1908 the Constitution was amended by transferring the election of members of all grades from the membership at large to the Board of Direction. The vote on this amendment was 892 to 317.

In 1915 in order to provide for a more general representation on the Board of Direction, the territory occupied by the Society was divided into 13, instead of 7, Districts, each to be represented on the Board of Direction, the vote on this question being 1 066 to 83.

A number of amendments to the Constitution have been proposed and rejected. Among the most important of these was one, submitted in March, 1907, increasing certain of the admission requirements, particularly for the grade of Member. This was lost by a vote of 429 to 847.

In 1914 an amendment was offered which would have changed the status of the Secretary of the Society by excluding him from membership on the Board of Direction. This amendment was lost by a vote of 1 343 to 1 828.

Engineering Congresses.

Three International Engineering Congresses in which the Society was active, have been held in the United States. The first was held in 1893 in connection with the World's Columbian Exposition at Chicago. This Society took charge of Division "A", Civil Engineering, the work of which was described at the joint meeting of all divisions, August 5th, 1893, as follows:

"Six sessions have been held, and the work accomplished can be best shown by the following statement: Sixty-three papers in all were presented. Of these fifty had been printed and distributed for discussion, and covered about 1 200 pages of printed matter, with numerous plates and cuts.

"The subjects treated may be classified under the following heads:

"Common Roads; Railways, Terminal Systems, Signaling, Locomotives, etc.; Cable Railways; Bridges, Substructure and Superstructure; Canals; Foundations; Surveys and Surveying Instruments; Metals—Their Treatment for Substructural Purposes; Grain Elevators; Paving Brick; Carbon—Its Use in Electrical Engineering; Electric Light Plant; Hoisting Machinery; Inland Transportation; Navigation Works; Improvement of Rivers; Improvement of Harbors; The Plant of Commercial Ports; The Laying Out of Cities; Water Works; Sewers and Sewerage; Tunnels, and The Testing of Building Material.

"Twelve countries are represented in the authorship of these papers, as follows:

Germany furnished	20	Canada	3
Mexico	6	Italy	1
Portugal	5	Australia	1
England	3	United States	18
Holland	2		—
France	2	Making a total of	63
South America	2		

"The work of translation of papers presented in foreign languages has been done in every instance by volunteers from the membership of the Society, by gentlemen thoroughly conversant with the subject under consideration.

"The interest manifested in the papers presented is evidenced by the fact that 318 engineers registered during the session of this Division, and the average attendance at each session was about 125.

"The discussions have taken a wide range, and, on account of the limited time, have been entirely confined to those presented orally. Many interesting and valuable written discussions were received, which it was entirely impossible to present at the sessions, but which will be published in connection with the papers.

"The number of valuable additions to the literature on the subjects mentioned is so great that it is impossible in this summary to do them all justice, and it is thought best not to attempt it.

"It may, however, be asserted that the results of the sessions of this Division of the Congress will be far-reaching and productive of great benefit to the profession of Civil Engineering all over the world."

The second International Engineering Congress was held in connection with the Louisiana Purchase Exposition at St. Louis, Mo., in October, 1904.

In 1903 this Society was invited by the Directors of the Louisiana Purchase Exposition to undertake the arrangements for an International Engineering Congress. Our Board of Direction appointed a Committee, and this Committee invited the co-operation of the other National Engineering Societies, but, for some reason which was never explained, they did not entertain the proposition favorably. Inasmuch as the inauguration and conduct of the proposed Congress had been placed upon this Society by the management of the Exposition, the Board determined, on January 4th, 1904, that the Society should undertake it alone, assuming the entire cost.

At that date nothing, even of a preliminary nature, had been done, and the organization, the securing, editing, and publishing of papers and discussions, as well as arrangements for meetings, devolved entirely upon the writer and his staff.

The first paper was received on March 29th, 1904, and between that date and October 1st, 1904, 83 papers were edited, printed, and circulated in advance, many discussions being received. The work of translating many of these foreign papers was undertaken by volunteers from the membership of the Society.

The Congress was held from October 3d to 8th, 1904. Its activities were divided into eight sections, 28 meetings were held, the average attendance at each being 50. In the discussion of the 38 selected sub-

jects, 97 formal papers, written by prominent specialists by invitation, were presented. In addition, 78 communications from engineers unable to be present were read, and there were 272 oral discussions at the Sectional meetings.

The proceedings were published subsequently in six extra volumes of *Transactions,* every member of the Society receiving copies of these volumes free of charge. The total edition was 4 000, and, in addition, separate pamphlets covering each of the subjects were printed, a total of 43 575 separate pieces being handled.

From foreign sources 46 out of a total of 96 papers, and 91 out of a total of 302 discussions, were furnished.

The attendance at the Congress was: from the United States 724; Canada, Cuba and Mexico 17; South America 10; Europe (13 countries) 111; Asia 10; Australia 4, a total of 876.

The total cost was $38 500, of which about $5 000 was received from subscription and sales of publications, the total net cost met by the Society being about $33 500.

The third International Engineering Congress in which the Society participated was held in connection with the Panama-Pacific Exposition, in San Francisco, Cal., September 20th-25th, 1915.

The plan of management of this Congress and the method of financing it, both of which were suggested by the writer, were as follows:

The original financial plan was that the cost should be underwritten as follows:

(1) By a general subscription from engineers residing in the Pacific Coast region.....		$10 000
(2) By the five National Societies, in the following proportion:		
American Society of Civil Engineers.....	$9 000	
American Institute of Electrical Engineers..	9 000	
American Society of Mechanical Engineers..	5 000	
American Institute of Mining Engineers....	5 000	
Society of Naval Architects and Marine Engineers	2 000	$30 000
The estimated cost of the Congress was.....		$40 000

A General Committee of Management was composed of the President and Secretary of each of the four Founder Societies and of the

Society of Naval Architects and Marine Engineers, with four additional members from each Society resident in San Francisco.

The ten officers of the Societies mentioned formed a Committee on Participation, through which invitations to take part were transmitted to other Engineering organizations both at home and abroad. This Committee also arranged for providing the funds necessary to carry on the work.

The members of the Committee resident in San Francisco formed a Committee of Management to carry out the work in detail on the ground, W. F. Durand being Chairman and W. A. Cattell, Secretary-Treasurer.

This Committee took charge of the receipt, editing, printing, and distribution of the papers and discussions, which were finally issued in 13 volumes.

The total cost of the Congress was approximately $77 000. Of this amount:

Pacific Coast Engineers contributed	$10 413.00
American Society of Civil Engineers contributed	7 740.00
American Institute of Mining Engineers contributed	4 300.00
American Society of Mechanical Engineers contributed	4 300.00
American Institute of Electrical Engineers contributed	4 300.00
Society of Naval Architects and Marine Engineers contributed	1 720.00
Total	$32 773.00

The remainder of the total expense was received from membership fees, sale of additional volumes, etc., etc.

The Annual Convention of this Society was held in San Francisco during the week before the Congress, and similar meetings of the other Founder Societies were also held, thus assuring a good attendance. This was a somewhat memorable occasion, inasmuch as a special transcontinental train for the accommodation of the members of all these organizations, and other members of the Congress, was arranged for by the Joint Committee on Entertainment and Transportation of which the writer was Secretary.

The Congress consisted of opening and closing sessions, and 51 technical meetings. The total attendance was approximately 800, and

there were about 50 official delegates. Owing to the state of war existing in Europe, the foreign participation was much more limited than had been expected when the Congress was originally undertaken.

The product of this Congress was not distributed gratis to any of the members of the Societies participating, as was the case in 1904.

Publications.

The first paper printed by the Society was an Address delivered by President James P. Kirkwood directly after the reorganization of the Society in 1867.

The number of *Transactions* for November, 1873, was the first issued. The first 57 papers, which were printed separately, make up Volume 1 and part of Volume 2. Volume 3 begins with the number of *Transactions* for May, 1874, and Volume 4 with that of April, 1875. Between that date and 1886 the number of pages published was only sufficient to fill one volume per annum, but, beginning with 1887, and continuing until 1892, two were issued yearly, the total number of volumes up to that date being 28. In 1893 two extra volumes of *Transactions* were issued containing the product of the Civil Engineering Section of the International Engineering Congress.

Up to the end of 1895 the *Proceedings* and *Transactions* were issued together in monthly numbers, and, in order to preserve them for future reference, they had to be separated and bound in individual volumes.

The difficulty with this method was that a paper intended to be submitted to the Society was not published until it had been read at a meeting, and the discussion upon it, which was limited to the few who attended the meeting or who had received advance copies, had been edited, printed, and collated. Under these conditions the membership of the Society at large never saw or heard of any paper until the discussion of it was complete, which frequently was six months, and in some cases as long as eighteen months, after the paper had been received. The result of this was that the monthly numbers of *Transactions* lacked current interest, and when received by members frequently remained in their wrappers until sent to the binder when the entire yearly volume had been received.

The writer well remembers that one of the first pieces of work assigned to him as Assistant Secretary, in March, 1892, was the getting ready for publication of the number of *Transactions* for September of the preceding year.

In 1892-95 the issue, in addition to the regular *Transactions,* of a *Bulletin* in leaflet form, calling attention to current events and giving abstracts of the papers in advance of the date at which they were to be presented, was tried. The great difficulty with this was the preparation of proper abstracts. The experience of the writer leads him to the belief that a technical abstract, in order to be really good, must be prepared by one who is expert in the particular subject treated, and that, even in this case, he must study the paper carefully and write the abstract in his own words. Any attempt to produce an abstract of a paper by quoting here and there a paragraph is not productive of satisfactory results.

In January, 1896, the publication of our present monthly *Proceedings* was begun, the technical matter contained in these being subsequently collated and published in volumes of *Transactions.*

This method was new in Society publications, and has since been adopted by others. By it the member is interested in the receipt of his monthly Number, because it contains: (1) brief accounts of Society business, including abstracts of minutes of Society Meetings both in New York and in the headquarters of Local Associations, list of additions to the membership, announcements of future meetings, and other items of general interest; (2) not only the papers to be presented, but also the discussions upon them, which are published serially until each subject is exhausted.

It is a matter of pride that, during the 22 years that this publication has been issued, it has never failed to be mailed to the membership on the fourth Wednesday of the month, although at times the issues have contained as much matter as an ordinary volume, in one case 650 pages.

In March, 1899, the writer was authorized by the Board to publish in *Proceedings* a list of current engineering articles of interest. This was started in a modest way, and was evidently found useful by the membership, because a request soon came that it be printed on one side of the page only, in order that members might cut out items which specially interested them, and use them in their own indexes. This list, which has been published continuously in each

monthly number of the *Proceedings* from that date, is made up from an examination of about 115 periodicals. The classification is very simple, as the list is intended to be of current interest only, and to enable an engineer to glance over each month the publications relating to his particular line of work, and to select therefrom such articles as he may read either in some convenient library or by obtaining them from the publisher.

In order to show briefly the quantity of material written, edited, and published, the total number of pages issued in the Society publications for the twenty-five years from 1867 to 1892, was 17 747 (yearly average, 710), and for the twenty-five years from that time to date has been 96 800 (yearly average, 3 872), making the total pages 114 547. The cost of the printing, binding, and postage (nearly all the postage being chargeable to publications) for the latter period has been about $724 000 (yearly average, $28 960).

The actual handling, preparation for mailing, and mailing, of all these publications has been done by the Society force during that period.

In 1911 the writer presented a Report to the Board of Direction, and subsequently to the Business Meeting of the Annual Convention of that year, suggesting that there would be many advantages if a change were made in the method of getting out our publications. The report stated that he had investigated this possibility for some time and recommended that it be tried. Briefly, the idea was to continue the publication of *Proceedings* as heretofore, but to publish only one volume of *Transactions* per annum, such volume to contain as much matter as the four that were issued at that time. This was to be accomplished by the use of thin "India", or as it is commonly called "Bible", paper. Up to 1908 two volumes of *Transactions* had been issued yearly, but, beginning with 1909, four volumes were issued per annum. (In 1910 five volumes were issued.) These volumes contained between 550 and 600 pages each. The direct benefits were fully stated in this Report.*

The recommendation was approved and the first of these thin-paper volumes was issued in 1912.

It may be set down as axiomatic in Society work that no matter what may be done, it will not please the entire membership, and this case was no exception. So many criticisms were received, with in-

* *Proceedings*, Am. Soc. C. E., Vol. XXXVII, p. 319.

quiries as to why the Society had adopted the use of "tissue" paper in its publications, etc., etc., that in April, 1914, a circular was issued asking two questions:

(a) "Shall the use of thin paper be continued in the monthly *Proceedings?*

(b) "Shall the use of thin paper be continued in the one yearly volume of *Transactions,* or shall the same number of pages be issued in *Transactions* on thick paper, in four volumes per annum"?

The result of this was that in a very large vote of about 3 000, 90% of those voting was in favor of the use of thin paper in the monthly *Proceedings,* and 95% was in favor of its use in *Transactions.*

As was foreseen, the points that appealed to the membership were the great saving to individuals in shelf room, in the cost of binding, and in economy in time by the use of one index instead of four.

Annual Conventions.

An Annual Convention has been held each year during the last twenty-five years, except in 1917, when the Convention which was to have been held in Minneapolis and St. Paul was abandoned on account of the war. Twenty-one separate localities have been visited. Two Conventions were held in Chicago, two in Niagara Falls, and two in San Francisco. All of them have been exceedingly enjoyable, have brought the members from various sections into closer contact, and have been of material benefit to individuals and to the Society.

It is perhaps worthy of notice that during this period three of these meetings have been held on the Pacific Coast, which up to 1896 was farther away from headquarters than the Society had ever held an official meeting, and that four were held on foreign soil, two in Canada, one in England, and one in Mexico.

It would extend this review too far even to touch upon the interesting events of these meetings, but perhaps it is permissible to call attention to the fact that the trip to London was made on the invitation of the Institution of Civil Engineers, that our meetings were held in the home of that Institution in London, and that the whole party had the honor and pleasure of being received by Queen Victoria at Windsor Castle. It might, perhaps, also be stated that the Mexican Convention was held by invitation of President Diaz. Members who

are interested will find quite full details of these trips in the *Proceedings*.

A special party was made up in March, 1911, to visit the Panama Canal. This was a more or less unofficial party. Two of the United Fruit Company's steamers were chartered for the occasion, one sailing from New York and the other from New Orleans, meeting at the Isthmus, and the party generally keeping together on the return. All the arrangements were made by the writer, who, unfortunately, was unable to go, due to the pressure of other duties, but he knows from what he heard from those who were fortunate enough to make it, that the trip was a specially enjoyable one.

Special Committees.

Reference should also be made to the splendid work of Special Committees appointed to investigate and report upon Engineering problems, twelve of which have made Final Reports during the period under consideration. The results of their work have been of inestimable value, but all that is possible, within the limits of this review, is to enumerate the subjects upon which such reports have been received.

Final Reports have been published on the following subjects:

Impurities in Public Water Supply; Standard Rail Sections—two Committees reported on this, one in 1893 and one in 1910—Uniform Methods for Testing Materials Used in Metallic Structures, and Requirements for These Materials to Further Improve the Grade of Such Structures; Standard Time; Regulating Practice of Engineering; Status of the Metric System in the United States; Uniform Tests of Cement; Conditions of Employment of, and Compensation of, Civil Engineers; Concrete and Reinforced Concrete; Principles and Methods for the Valuation of Railroad Property and Other Public Utilities; and Floods and Flood Prevention.

At the present time six Special Committees, all of which have presented one or more reports of progress, are investigating the following subjects:

Engineering Education; Steel Columns and Struts; Materials for Road Construction; Bearing Value of Soils for Foundations; Regulation of Water Rights; and Stresses in Railroad Track.

Medals and Prizes.

On October 1st, 1912, the Society established two additional prizes, as follows: The J. James R. Croes Medal, named in honor of the first recipient of the Norman Medal; and the James Laurie Prize, named in honor of the first President of the Society. The first consists of a medal of the value of $40, and may be awarded annually to such paper as may be judged worthy, and be next in order of merit to the paper to which the Norman Medal is awarded; the second consists of $40 in cash, with an engraved certificate signed by the President and by the Secretary of the Society. This prize also may be awarded annually, under the rules governing the award of the Thomas Fitch Rowland Prize, to such paper as may be judged worthy and be next in order of merit to the paper to which the Thomas Fitch Rowland Prize is awarded.

In a recent issue of *Engineering News-Record* the following editorial appears:

"AND THEY ARE FIGHTING IN FRANCE"

"The 'Subsidence of Muck and Peat Soils in Southern Louisiana and Florida' was the title of a paper presented two weeks ago at the meeting of the American Society of Civil Engineers. With the exception of three war addresses, equally peaceful topics have occupied the meetings since last April. The fall program, so far as announced, contains no papers bearing on the tremendous industrial and engineering problems which the winning of the war demands that we solve. This is an engineering war, yet the society seems not to recognize its opportunity."

It is unfortunate that such an improper, unfounded and sarcastic editorial insinuation should be made about an organization whose aims and objects are clearly unselfish, in a commercial publication on which the Profession in a large measure depends for its technical news.

The time for this attack upon the loyalty of this Society—just after it has become one of the Founder Societies—leaves an impression of malicious intent.

Of late all of us have heard much of the use of previously unheard of methods of warfare, and the writer feels sure that every right-minded member of our Allies of the Mining, Mechanical and Electrical Societies will unite with the members of this Society in condemnation of this misuse of editorial prerogative.

It is hoped that the following brief statement—written before the appearance of this insult to the Board of Direction and to the Membership of this Society—will be a sufficient answer.

War Activities.

As soon as war was declared, the Society placed its facilities at the disposal of the Government, and, both as an individual organization and jointly with the other Founder Societies, has done all it has been asked or permitted to do.

The value of the Engineer has been recognized to a greater extent than ever before, and in the wonderful progress made in raising, training, transporting, and maintaining the new Army of the United States, as well as in the investigation and solution of new problems, he has been a most important factor.

A Joint Committee representing the National Societies, of which William Barclay Parsons, M. Am. Soc. C. E., was Chairman, was active in securing the legislation which provided for the Engineer Reserve Corps, and Committees made up of members of these Societies have been instrumental in recruiting Engineer Regiments in many parts of the country.

In 1915, in the absence of President Marx, the writer was requested by a Sub-committee of the Naval Consulting Board to co-operate with it and representatives of other National Societies, to formulate plans for industrial preparedness. He reported to the Board of Direction, on January 17th, 1916, that a plan had been developed by the Sub-committee, acting in conjunction with the five National Societies representing the Civil, Mining, Mechanical, Electrical, and Chemical Engineers, for securing complete statistics of the industrial strength of the country. Under this plan, in each State of the Union, one representative, recommended by each of these Societies, was appointed as an Associate Member of the Naval Consulting Board, and the five Engineers thus appointed in each State constituted a Board to secure the necessary information for the Government through the aid of the more than 30 000 members of these organizations. As is well known, this great work was carried to a successful conclusion.

In these and in many other ways the Society, and its Board of Direction, has been active in the present emergency.

Every member of the Society must read with pride our "Roll of Honor", the first issue of which,* incomplete as it undoubtedly is, contains the names of 575 Engineer officers who are now serving in the Army and Navy. Since that list went to press, 148 have been added to it, and it is still incomplete. This means that more than 8½% of the entire membership wears a uniform. The list, however, does not contain the names of hundreds of other members who are serving their country unobtrusively but still no less unselfishly and effectively, on Advisory Boards or simply as citizens. The writer knows of many cases where at great personal sacrifice such work has been and is now being done.

Only a few days ago a suggestion was made somewhat timidly over the telephone by J. W. DuB. Gould (one of our Members who is devoting his time to the service of the Government but who is one of those mentioned as not listed on our "Roll of Honor") that perhaps the Society might consider some arrangement by which the United States Food Administration could secure the use of the House we so recently vacated in order to carry on its work in New York City and State. The writer at once said that he believed that the Society would be glad to offer this House for the use of the Nation, for the purpose specified, free of charge.

It was not possible to get the Board together; indeed, in these busy times, a meeting of the Executive Committee is difficult to secure. By telephone, however, each available member of that Committee has given his unqualified and enthusiastic support to the proposition; the arrangement has been made, and the U. S. Food Administration Board will begin work at our old home on Friday of this week.

It is perhaps unnecessary to state that the head of this most important Board is a Member of this Society—Herbert C. Hoover.

Society Staff.

Any statement of the activities of the Society would be incomplete without special mention of the staff of the Secretary. It is not a large one. Before the transfer of the Library the total number (exclusive of Janitors and Office Boys) was 22; since that time it has been somewhat reduced. T. J. McMinn, M. Am. Soc. C. E., Assistant Secretary, and Miss Eleanor H. Frick, Chief Office Assistant, have served the Society for twenty years, and fourteen others for periods varying from

* *Proceedings*, Am. Soc. C. E., Vol. XLIII, p. 698 (November, 1917).

18 to 3 years, the average length of service of the entire force being more than 11 years. The Society owes much to the work of its employees, and the writer wishes to acknowledge publicly the faithful, industrious, efficient, and loyal service which has been rendered to the Society at all times, as well as to express his personal obligation to each of them.

Functions of a National Technical Society.

The writer believes that the primary functions of a National Technical Society might be stated about as follows:

1—To advance engineering knowledge and practice.

2—To maintain the dignity and standing of the organization, and to preserve the high character and professional qualifications of its membership.

3—To keep in touch with, and to take proper action on, all matters in which the relation of the Profession to the public is involved, and to render service to the Nation when occasion demands.

4—To do whatever is possible for its Members individually, and, in general, to return to them an equivalent for the dues paid.

The latter function necessarily takes the form of providing opportunity for professional discussion, both formal and informal, which, when, as is the case in this Society, more than 80% of the membership is non-resident, must be through publications.

The use of the Library should be brought as far as possible within the reach of all, and all matters brought to the attention of the management by correspondence should be handled promptly and efficiently, including the keeping of special records of members seeking professional engagements in order that they may be placed at the disposal of inquirers for technical men in any specialty.*

Perhaps the most difficult problem is to succeed in making each member feel that he is getting as much benefit as every other member. The men who framed the Constitution of the Society were wise enough to make a decided difference in the amount of dues to be paid by Resident and Non-Resident Members, but, although the Resident Member pays 66% more than the Non-Resident, the latter is still inclined to feel that those who live near Headquarters derive disproportionate benefits, in that they may attend all meetings, use the Reading Room, con-

*While the Society has not advertised as an employment bureau, this plan has been in use for many years, and hundreds of members have been put in touch with professional opportunities.

sult the Library, and otherwise avail themselves of all local privileges.

It is not possible, of course, to arrange matters so that the Non-Resident can secure all these privileges, but, during the past twenty-five years, every effort has been made to do away with this feeling. How successful these efforts have been must be left to the individual judgment of each member, and it is hoped that what has been herein set down will aid in the formation of that judgment.

Co-operation.

Why did this Society move its Headquarters? It occupied, as has been shown, a dignified, satisfactory, commodious House, in an excellent location, which was fully paid for; its standing as an organization left nothing to be desired; its membership was increasing rapidly in all parts of the country. Why, then, give up that which had been achieved by many years of unremitting effort?

It seems to the writer that the answer is that it was the right thing to do. What if, as an organization, some sacrifices were made? What if certain details of the movement did not appeal to certain individuals? Was it, or was it not, the thing to do, from the standpoint of the Engineering Profession? The best answer to these enquiries appears to be the vote of the membership, which was 2 500 in favor of, and only 390 against the change.

Since the inception of this co-operative movement the writer has been intimately associated with it, and in close contact with the men chosen by the Founder Societies to represent the other branches of our great Profession, and can testify that the most broad-minded, earnest, and sincere spirit of co-operation has been manifest.

In a report to the Board of Direction dated September 20th, 1915, the writer said:

"The value of unity of action in all matters which affect the Profession generally must be conceded.

"For many years the undersigned has been endeavoring to bring about such a condition; he has served on the John Fritz Medal Board of Award since its organization, and as its Executive Officer for 8 or 9 years; and is now its Chairman; has, with Mr. Ridgway, represented our Society on a joint committee for the consideration of a number of subjects * * *. He has actively represented the Society on the Committee of Management of the International Engineering Congress, and has been honored by the United Engineering Society by election to, and is now serving on, the Engineering Foundation Board.

"This experience has convinced him that there should be a permanent Board or Committee, composed of an equal number of representatives of the four National Societies, to which the duty of representing the 30 000 professional men now enrolled in their membership should be given. There are many ways in which such a representative body could help the status of the engineer, in his relations with clients, employers, and the public generally, which cannot, for obvious reasons, be taken up by any one of the Professional Societies individually, and it has been his thought that an organization now exists (the United Engineering Society) which, if the representatives of the Civil Engineer are added, and its powers somewhat expanded, would be ideal for the purpose. He now believes that this matter should be the subject of discussion between the Committees of this Society and of the United Engineering Society and that the result of their deliberation should be made part of the question to be submitted to all the organizations concerned."

Two years have elapsed since this was written, and without doubt the establishment of the "Engineering Council" was intended to provide for this long felt want. Although, up to the present time, the writer has seen no reason for changing the opinion expressed—that the United Engineering Society is the organization best fitted to act on these most vital matters—it is hoped and expected that the new body will prove its value.

The years covered by this review have been indeed busy ones, not without times of serious difficulty and trial, but the bright spots after all have predominated. Association with the leaders of thought along Engineering and Scientific lines is always broadening and helpful, and the writer looks back with pleasure only on the twenty-six years devoted to the service of the American Society of Civil Engineers, during twenty-three of which he has had the honor to be its Executive Officer and a member of its Board of Direction.

APPENDIX A

CLASSIFICATION OF THE LIBRARY OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS 1898–1916

BY

CHAS. WARREN HUNT
Secretary

A—RAILROADS
- Aa General
- Ab Location
- Ac Construction
- Ad Equipment
- Ae Operation
- Af Legal Documents
- Ag Reports, Company
- Ah Reports, State
- Ai Reports, Government
- Aj History

B—RAILROADS, STREET
- Ba General
- Bb Location
- Bc Construction
- Bd Equipment
- Be Operation
- Bf Legal Documents
- Bg Reports, Company
- Bh Reports, City
- Bi Reports, State
- Bj History

C—WATERWAYS
- Ca General
- Cb Rivers
- Cc Harbors
- Cd Lakes
- Ce Oceans
- Cf Canals
  - Cfa History
  - Cfb Location
  - Cfc Construction
  - Cfd Equipment
  - Cfe Operation
  - Cff Legal Documents
  - Cfg Reports, Company
  - Cfh Reports, State
  - Cfi Reports, Government

D—WATER SUPPLY
- Da General
- Db Water
- Dc Works
- Dd Power
- De Irrigation

E—SANITATION
- Ea General
- Eb Drainage
- Ec Sewerage
- Ed House Drainage
- Ee Sewage Disposal
- Ef Garbage Disposal
- Eg Health and Disease
- Eh Ventilation and Heating

F—BRIDGES
- Fa General
- Fb Arch
- Fc Cantilever
- Fd Draw
- Fe Girder
- Ff Lift
- Fg Suspension
- Fh Truss
- Fi Viaducts

G—MECHANICAL
- Ga General
- Gb Hydraulic Machinery
- Gc Steam Engines
- Gd Boilers
- Ge Compressed Air

H—ELECTRIC
- Ha General
- Hb Light
- Hc Power
- Hd Telegraph
- He Telephone
- Hf Various Uses

I—GAS
- Ia General
- Ib Coal
- Ic Natural
- Id Water

J—ARCHITECTURE AND BUILDING
- Ja General
- Jb Buildings
- Jc Materials
- Jd Laws
- Je Fire Prevention

K—MARINE
- Ka General
- Kb Yards
- Kc Ordnance
- Kd Naval Ships
- Ke Merchant Ships
- Kf Steam Boats

L—MILITARY
- La General
- Lb Tactics
- Lc Fortifications
- Ld Ordnance

M—MINING
- Ma General
- Mb Coal
- Mc Copper
- Md Gold and Silver
- Me Iron

N—ROADS AND PAVEMENTS

Na	General
Nb	Earth
Nc	Broken Stone
Nd	Plank
Ne	Monolithic
Nf	Brick
Nh	Stone Block
Ni	Wooden Block

O—MUNICIPAL REPORTS

P—LANDSCAPE ARCHITECTURE

Q—GEOGRAPHY

Qa	General
Qb	Physical
Qc	Statistics
Qd	Resources
Qe	Surveys
Qf	Maps and Atlases

R—SURVEYING AND DRAWING

S—SOCIETY PUBLICATIONS

Sa—North America:

Sa1	Canada
Sa2	Mexico
Sa3	United States

Sb—South America:

Sb1	Argentine Republic
Sb4	Chile
Sb11	Venezuela

Sc—Central America

Sd—Europe:

Sd1	Austria
Sd2	Belgium
Sd3	Denmark
Sd4	France
Sd5	Germany
Sd6	Great Britain
Sd8	Italy
Sd9	Netherlands
Sd10	Norway
Sd11	Portugal
Sd13	Russia
Sd14	Spain
Sd15	Sweden
Sd16	Switzerland

Se—Asia

Sf—Africa

Sg—Australia

T—PERIODICALS

Ta—North America:

Ta2	Mexico
Ta3	United States
Ta4	West Indies

Tb—South America:

Tb1	Argentine Republic
Tb3	Brazil
Tb5	Colombia
Tb6	Ecuador
Tb9	Peru
Tb11	Venezuela

Td—Europe:

Td1	Austria
Td2	Belgium
Td3	Denmark
Td4	France
Td5	Germany
Td6	Great Britain
Td7	Hungary
Td8	Italy
Td9	Netherlands
Td10	Norway
Td13	Russia
Td14	Spain
Td15	Sweden

Te—Asia

Tg—Australia

U—DICTIONARIES AND ENCYCLOPEDIAS

V—ENGINEERING HANDBOOKS

Y—GENERAL SCIENCE

Ya	General
Yb	Agriculture and Forestry
Yc	Astronomy
Yc5	Biology
Yc9	Botany
Yd	Chemistry
Ye	Education
Yf	Exhibitions
Yh	Geology
Yh9	Mathematics
Yi	Metallurgy
Yj	Meteorology
Yk	Patents
Yl	Physics
Ym	Weights and Measures
Yn	Zoology

Z—MISCELLANEOUS

Za	General
Za5	Archaeology
Zb	Biography
Zc	Charities and Corrections
Zd	Commerce
Ze	Fine Arts
Zf	Fisheries
Zg	History
Zh	Law
Zi	Manufactures
Zj	Political Economy
Zk	Religion

APPENDIX B

PROPOSED CLASSIFICATION

FOR AN

ENGINEERING LIBRARY

COMPILED BY ELEANOR H. FRICK AND ESTHER RAYMOND
OF THE LIBRARY STAFF OF THE
AMERICAN SOCIETY OF CIVIL ENGINEERS
UNDER DIRECTION OF THE SECRETARY

1916

Accompanying "The Activities of the American Society of Civil Engineers During the Past Twenty-five Years", by Chas. Warren Hunt, M. Am. Soc. C. E.

EXPLANATORY

Civil Engineering is the only class which has been expanded in detail. Certain subjects have, of necessity, been classed arbitrarily, the principal thought being utility. For instance, "Water Wheels" are placed under "Water Power" rather than under "Hydraulic Machinery"—"Locomotives" under "Railroads" rather than under "Steam Engines".

ACKNOWLEDGMENT

To acknowledge every source used in compiling this classification is not possible, because hundreds of books and indexes have been examined; mention should, however, be made of unpublished material of the Joint Committee on Classification of Technical Literature; publications of the Library of Congress, University of Illinois Extension of Dewey, and the Dewey Decimal Classifications. To John M. Goodell, and Henry S. Jacoby, Associates, Am. Soc. C. E., T. J. McMinn, and A. H. Van Cleve, Members, Am. Soc. C. E., Mr. H. E. Haferkorn, Librarian, U. S. Engineer School, Washington Barracks, and members of the Special Committee on Materials for Road Construction, of the American Society of Civil Engineers, special acknowledgment is made.

CLASSES

000 GENERAL
100 CIVIL ENGINEERING
200 MECHANICAL ENGINEERING
300 ELECTRICAL ENGINEERING
400 MINING ENGINEERING
500 METALLURGY
600 GAS ENGINEERING
700 CHEMICAL TECHNOLOGY. MANUFACTURES
800 MILITARY AND NAVAL SCIENCE
900 OTHER SUBJECTS

DIVISIONS

000 GENERAL
010 Engineering Bibliographies
020 Engineering Encyclopedias
030 Engineering Dictionaries
040 Engineering Directories
050 Engineering Societies
060 Engineering Periodicals
070 Patents
080 Engineering in General
090 Materials of Engineering

100 CIVIL ENGINEERING
110 Structural Engineering. Bridges. Buildings
120 Surveying
130 Railroads
140 Street Railroads
150 Highways
160 Hydrology. Hydraulics. Dams
170 Waterways
180 Water Power. Water-Works. Irrigation. Drainage
190 Sanitation

200 MECHANICAL ENGINEERING
210 Power Transmission. Millwork
220 Heat Engineering
230 Automobiles
240 Aeronautics
250 Hydraulic Machinery
260 Machinery for Special Purposes
270 Machine Shops
280 Miscellaneous Types of Power

300 ELECTRICAL ENGINEERING
310 Electric Measurement
320 Dynamo-Electric Machinery
330 Control
340 Transmission
350 Telephone
360 Telegraph
370 Lighting
380 Chemical Electricity. Batteries.
390 Other Uses

400 MINING ENGINEERING
410 Prospecting. Mine Surveying
420 Excavation and Working
430 Drainage and Sanitation
440 Transportation
450 Ventilation
460 Lighting. Signaling
470 Electricity in Mining
480 Accidents. Safety Measure
490 Mining Special Kinds of Ore

500 METALLURGY
510 Iron and Steel
520 Gold and Silver
530 Copper
540 Lead
550 Tin
560 Zinc
580 Other Metals
590 Assaying

600 GAS ENGINEERING
610 Natural Gas
620 Materials
630 Manufacture and Works
640 Storage
650 Distribution
660 Utilization
670 By Products
680 Management

700 CHEMICAL TECHNOLOGY. MANUFACTURES
710 Chemicals. Dyes. Paints
720 Ceramics
730 Metal Manufactures. Machinery
740 Lumbering. Wood Manufactures
750 Paper Making
760 Textiles
770 Leather Manufacture. Tanning
780 Foods and Beverages
790 Miscellaneous Industries

800 MILITARY AND NAVAL SCIENCE
810 Military Science. General
820 Fortifications
830 Ordnance
840 Naval Architecture. Shipbuilding
850 Yards
860 Navigation. Shipping
870 Naval Science. War Vessels
880 Naval Strategy and Tactics
890 Naval Organization

900 OTHER SUBJECTS
910 Philosophy.
920 Religion
930 Sociology
940 Philology
950 Natural Science
960 Useful Arts (Other than Engineering and Manufactures)
970 Fine Arts
980 Literature
990 History

SUB-DIVISIONS

To Be Used With Any Class or Sub-Class

The following nine divisions have been used as the first general sub-divisions under each main class. They may also be used with sub-divisions of any class. For instance, the sub-division *Costs and Estimates* (.04) may be applied to the general subject of Electrical Engineering (300.04), and may also be used under *Dynamo-Electric Machinery* (320), a sub-division of Electrical Engineering (320.04), and also under *Dynamotors* (322.3), which is a sub-division of *Dynamo-Electric Machinery* (322.304)—*Dynamo-Electric Machinery* being 320, sub-division *Direct-Current Machinery* being 322, and sub-division *Dynamotors* being 322.3.

.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories

000 **GENERAL**
010 **Engineering Bibliographies**
020 **Engineering Encyclopedias**
030 **Engineering Dictionaries**
040 **Engineering Directories**
050 **Engineering Societies**
060 **Engineering Periodicals**
070 **Patents**
080 **Engineering in General**
081 **General Works**
085 **Ethics**
086 **Valuation of Utilities** (For Valuation of a special utility see special subject)
087 **Industrial Management**
.1 Organization
.2 Efficiency Engineering
.21 Scientific Management. Motion Study
088 **Construction Work. Contracting**
.1 Contracts and Specifications. General Works (For Special Contracts and Specifications, *See* .05, under that subject)
.2 Organization
.3 Methods
.31 Timekeeping, etc.
.4 Inspection
.5 Contractors' Plant
089 **Excavation. Earthwork** (*See also* 420, Excavation and Working, under Mining Engineering)
.1 Earth Excavation
.2 Rock Excavation
.3 Excavating Machinery
.31 Steam Shovels
.32 Ditching and Trenching Machinery
090 **Materials of Engineering** (*See also* 111, Mechanics of Materials)
091 **Engineering and Testing Laboratories**
.1 Laboratory Manuals
.2 Testing Machines and Appliances
3 Methods of Testing

091 **Engineering and Testing Laboratories** (*Continued*)
.31 Selection of Test Pieces. Influence of Temperatures, etc.
.32 Weathering
.33 Elastic Limit Tests
.34 Tension, Compression, Torsion, Flexure, Shearing
.341 Tensile Tests
.342 Compression Tests
.343 Torsion Tests
.344 Flexure Tests
.345 Shearing Tests
.346 Repeated Stress Tests
.35 Impact. Repeated Shock Tests
.36 Hardness Tests
.37 Special Tests (Varying for different materials)
.38 Tests on Special Shapes and Forms
.39 Other Tests

092 **Timber. Strength and Testing**
.1 Influence of Temperature
.2 Weathering. Decay and Preservation
.3 Elastic Limit Tests
.4 Tension, Compression, Torsion, Flexure, Shearing
.5 Impact. Repeated Shock Tests
.6 Hardness Tests
.7 Special Tests for Timber
.8 Special Shapes
.81 Posts
.82 Columns
.83 Shafts
.84 Cylinders. Pipe, etc.
.9 Descriptions of Various Kinds of Timber (Arranged Alphabetically)

093 **Masonry Materials**
.1 Stone
.11 Influence of Temperature
.12 Weathering
.14 Tension, Compression, Shearing, Crushing
.15 Impact
.16 Hardness Tests
.17 Special Tests for Stone, etc.
.18 Special Shapes and Forms
.19 Descriptions of Kinds of Stone (Arranged Alphabetically)
.2 Brick
.21 Influence of Temperature
.22 Weathering
.24 Crushing Tests
.27 Special Tests
.271 Rattler Tests
.272 Absorption Tests
.3 Tile
.4 Terra Cotta
.5 Lime. Mortar
.6 Cement
.61 Influence of Temperature. Selection of Test Pieces
.62 Weathering
.63 Tension, Compression, etc.
.65 Impact Tests
.66 Soundness. Constancy and Time of Setting
.67 Special Tests
.671 Fineness of Grinding
.672 Accelerated Tests

094 **Concrete. Strength and Testing**
.1 Influence of Temperature and Mixing. Selection of Pieces
.11 Concrete Aggregates
.111 Sand
.112 Gravel
.113 Slag
.114 Water
.12 Forms. Removal of Forms
.13 Effects of Freezing on Concrete
.2 Weathering. Concrete Finishing
.21 Action of Salt Water
.22 Action of Gases and Other Chemicals
.23 Water-proofing
.24 Concrete Finishes. Stucco
.3 Elastic Limit Tests
.4 Tension, Compression, Torsion, Flexure, Shearing
.5 Impact
.6 Hardness

094 **Concrete. Strength and Testing** (*Continued*)
.7 Special Tests for Concrete
.8 Special Shapes
.81 Bars. Slabs
.82 Columns. Posts. Footings
095 **Reinforced Concrete. Strength and Testing**
.1 Influence of Temperature. Expansion and Contraction
.2 Weathering. Corrosion of Reinforcement
.3 Elastic Limit Tests
.4 Tension, Compression, Torsion, Flexure, Shearing
.5 Impact. Repeated Shock Tests
.6 Hardness
.7 Special Tests
.71 Bond of Concrete and Metal
.8 Special Shapes
.81 Bars. Beams. Slabs
.82 Columns. Posts. Struts. Footings
.83 Shafts
.84 Cylinders. Pipes, etc.
.9 Types of Reinforcement
096 **Other Non-Metallic Materials** (Glass, Asbestos, etc.)
097 **Iron and Steel**
.1 Effect of Temperature
.2 Weathering. Corrosion and Protection
.3 Elastic Limit Tests
.4 Tension, Compression, Torsion, Flexure, Shearing
.5 Impact
.6 Hardness
.7 Special Tests
.8 Special Shapes
.81 Bars. Beams
.811 Continuous Beams
.82 Columns
.83 Shafts
.84 Cylinders. Rollers. Spheres. Tubes. Pipes
.85 Rivets. Pins. Riveted Joints
.86 Nails. Screws. Bolts
.87 Angles. Shapes. Plates
.89 Other Shapes
.891 Springs
.892 Wire
.893 Chains. Chain Links
.9 Special Materials
.91 Cast Iron
.92 Wrought Iron
.93 Steel
098 **Metals** (Other than Iron and Steel)
.1 Copper
.2 Zinc
.9 Alloys
099 **Other Materials**

100 **CIVIL ENGINEERING**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories (*See also* 090, Materials of Engineering)
110 **Structural Engineering. Bridges. Buildings**
111 **Mechanics of Materials. Strength of Materials. General Theory**
.1 Beams
.11 Continuous Beams
.2 Columns. Posts. Struts
.3 Shafts
.4 Cylinders. Spheres
.5 Rollers. Plates
.6 Riveted Joints. Pin Proportioning
112 **Theory of Design. Stresses and Strains**
.1 Analytic Methods. Graphic Statics
.2 Loads and Stresses (General Material here. For Stresses in a Special Structure, *See* 112.9)
.21 Dead Loads
.22 Live Loads

112 **Theory of Design. Stresses and Strains** (*Continued*)
.23 Impact Loads
.24 Wind Pressure
.25 Snow Loads
.3 Iron and Steel Construction (General. For an Iron Truss Bridge, (*See* 112.92)
.4 Masonry Construction (General)
.41 Stone Construction (General)
.42 Brick Construction (General)
.5 Concrete Construction (General)
.6 Reinforced Concrete Construction (General)
.7 Timber Construction (General)
.8 Esthetics of Design
.9 Design of Special Types
.91 Arches. Arch Bridges
.911 Metallic
.912 Masonry
.913 Concrete
.914 Reinforced Concrete
.92 Trusses. Truss Bridges
.921 Simple
.922 Continuous
.93 Girders. Girder Bridges
.94 Movable Bridges
.941 Swing
.942 Lift. Bascule
Turntables (*See* 133.83)
.95 Cantilever Bridges
.96 Suspension Bridges
.97 Viaducts
.98 Other Forms of Bridges
.981 Ferry Bridges. Transporter Bridges
.982 Pontoon
.983 Trestles
.984 Tubular
.99 Roofs. Domes

113 **Foundations. Bridge Piers and Abutments**
General
.001 Exploration of Site
.0011 Borings
.0012 Supporting Power of Soils
.002 Theory of Design
.0021 Loads
.0022 Area of Foundation Required
.0023 Center of Pressure and Center of Base
.1 Underpinning. Shoring
.2 Spread Foundations
.21 Masonry Footings
.211 Stone
.212 Brick
.213 Concrete
.214 Reinforced Concrete
.22 Timber Grillage
.23 Steel Beam Grillage
.24 Eccentric Footing
.25 Cantilever Footing
.26 Inverted Arch
.3 Piles and Pile-Driving
.31 Timber Piles
.311 Mechanical Protection (Cement Mortar, Galvanized Iron, Pipe, etc.)
Preservation of Timber (*See* 092.2)
.32 Concrete Piles
.321 Pre-moulded
.322 Cast in Place
.33 Metal Piles
.331 Disk Piles
.332 Screw Piles
Sand Piles (*See* 113.913)
Pneumatic Piles (*See* 113.6)
.34 Sheet-Piles
.35 Pile-Drivers
.36 Driving by Water-Jet
.37 Bearing Power of Piles
.4 Coffer-Dams
.41 Earth
.42 Sheet-Pile

113 **Foundations. Bridge Piers and Abutments** (*Continued*)
- .43 Crib
- .44 Movable
- .45 Miscellaneous
- .5 Box and Open Caissons
- .51 Box Caissons
- .52 Single-Wall Open Caissons
- .53 Cylinder Caissons (Open Wall. Wood. Iron. Masonry)
- .54 Open Caissons with Dredging Wells
- .55 Hydraulic Caissons
- .6 Pneumatic Caissons
- .61 For Bridges
- .62 For Buildings
- .63 Caisson Disease
- .7 Pier Foundations in Open Wells
- .8 Bridge Piers. Bridge Abutments
- .81 Width of Waterway
- .9 Miscellaneous Processes
- .91 Consolidating the Soil
- .911 By Adding Sand
- .912 By Driving Wooden Piles
- .913 By Using Sand Piles
- .914 By the Compressol System
- .92 Drainage
- .93 Freezing
- .94 Grouting

114 **Retaining Walls**

115 **Bridges in General** (For Design, *See* 112)
- .1 For Special Uses (For general material only. Class with special type if possible)
- .11 Highway Bridges
- .12 Railroad Bridges
- .13 Military Bridges (*See also* 112.982 and 116)
- .14 Park and Ornamental Bridges
- .2 By Special Location
- .21 Skew Bridges
- .3 Of Special Materials (Divided like 090. Class with special type if possible)
- .4 Location. Approaches
- .5 Selection and Comparison of Types

Foundations. Bridge Piers and Abutments (*See* 113)

116 **Bridge Construction** (Put here only practical material on Erection, Maintenance, Failures, etc., and Descriptions of Bridges actually Built)
- .001 Shop Practice. Shop Inspection
- .002 Layout of Plant
- .003 Erection. Falsework. Erecting Equipment
- .004 Bridge Floors
- .005 Bridge Painting
- .008 Other Details
- .009 Maintenance (Inspection, Lighting, etc.)
- .1 Arch Bridges
- .2 Truss Bridges
- .3 Girder Bridges
- .4 Movable Bridges
- .5 Cantilever Bridges
- .6 Suspension Bridges
- .61 Towers
- .62 Anchorage
- .63 Cables
- .64 Stiffening Trusses
- .7 Viaducts
- .9 Other Forms
- .91 Ferry Bridges. Transporter Bridges
- .92 Pontoons
- .93 Trestles
- .94 Tubular

117 **Building Construction. Buildings**
- .003 Erection of Steel Buildings
- .02 Building Laws
- .1 Details of Construction
- .11 Floors
- .12 Ceilings
- .13 Stairs
- .14 Windows and Doors
- .15 Chimneys and Flues

117 **Building Construction. Buildings** (*Continued*)
.16 Roofs and Roofing (For Design of Roofs, *See* 112.99, Roofs, under Theory of Design)
.17 Vaults
.18 Walls. Partitions
.19 Other Details
.191 Fire Escapes
.192 Scaffolding
.193 Elevator Shafts
Ventilation and Heating (*See* 227)
.2 Educational, Government and Scientific Buildings. Exhibitions, etc.
.3 Business and Commercial (*See also* 117.7, Factories and Mill Buildings)
.31 Office Buildings
.32 Stores, etc.
.33 Markets
.4 Domestic Architecture. Residences
.41 Houses. Bungalows
.42 Tenement Houses. Housing of the Poor
.421 Model Factory Towns
.43 Apartment Houses
.44 Hotels
.5 Storage Buildings
.51 Bins (*See also* 133.86, Sand Plants and Bins, under Railroads)
.52 Coal Storage Plants
.53 Grain Elevators
.54 Ice Houses
.55 Lumber Sheds
.56 Warehouses
.6 Hospitals and Asylums
.7 Factories and Mill Buildings
.9 Other Buildings
.91 Prisons. Reformatories (*See also* Prisons, under Social Sciences)
.92 Churches. Monuments. Mausoleums
.93 Recreation Buildings
.931 Theatres
.94 Baths
.95 Public Comfort Stations
.96 Wash Houses. Public Laundries

118 **Fire Prevention and Protection**
.1 Fire Resistive Construction
.2 Fire Prevention and Extinction
.21 Fire Alarms
.22 Fire Extinction
.221 Automatic Sprinklers
.222 Chemical Engines. Chemical Systems
.223 Fire Engines, etc.
.224 Fire Boats
.3 Conflagrations (Arranged Alphabetically by Place)
.4 Fire Departments

119 **Other Structures**
.1 Stadium (*e. g.*, Yale Bowl)
.2 Subways for Passenger and Vehicular Traffic
.3 Pipe Subways

120 **Surveying. General**

121 **Instruments**
.1 Tapes, Chains, Rods, etc.
.2 Compass
.3 Transit and Theodolite
.31 Solar Attachment
.4 Sextant
.5 Photo Theodolite
.6 Plane Table
.7 Level
.71 Aneroid Barometer
.8 Drawing Instruments
.9 Other Instruments

122 **Land Surveying**

123 **City Surveying**

124 **Topographic Surveying**
.9 Photographic Surveying

125 **Geodetic Surveying**
.1 Triangulation. Base Lines
.2 Stations, Towers, etc.
.3 Adjustments of Errors
.4 Astronomical Observations

126 **Leveling**

127 **Plotting**
.1 Projections
.2 Lettering
.3 Photographic Reproductions. Blue Prints

130 **Railroads**
General
.01 History of Railroad Engineering
.011 History of Individual Railroads (Arranged by Railroad)
.02 Laws and Legislation. Legal Documents
.021 Of Individual Railroads (Arranged by Railroad)
.022 Of States or Provinces (Arranged by Name)
.023 Of Governments (Arranged by Name)
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
.9 General Descriptions of Railroads (Arranged by Name and Place)

131 **Location**
.1 Preliminary Plans. Economics of Location
.11 Land Grants
.2 Surveying
.21 Curves. Transition Spirals

132 **Construction of Roadbed** (To sub-grade)
Earthwork (*See* .089)
.1 Drainage. Culverts
.2 Tunnels and Tunneling
.21 Masonry Lining
.22 Grouting
.3 Grade Crossings. Track Elevation and Depression

133 **Construction and Maintenance of Permanent Way**
.1 Roadmasters' and Trackmasters' Regulations and Manuals
.2 Gauge
.3 Ballast
.4 Ties and Sleepers
.5 Rails
.51 Rail-fastenings
.6 Turnouts. Frogs and Switches. Track Crossings
.7 Removal of Wrecks, Snow, and Weeds
.71 Removal of Wrecks
.72 Removal of Snow
.73 Removal of Weeds
.8 Track Accessories
.81 Track Tanks. Fuel and Water Stations
.82 Ash-pits, etc.
.83 Turntables. Transfer Tables
.84 Fences, Cattle-guards, Snow Guards
.85 Snow Sheds
.86 Sand Plants and Bins
.9 Yards and Terminals

134 **Buildings**
.1 Passenger Stations
.2 Freight Stations
.3 Engine Houses. Roundhouses
.4 Shops
.5 Coal Sheds

135 **Rolling Stock**
.1 Cars
.11 Car Details
.111 Wheels
.112 Axles
.113 Bearings and Lubrication
.114 Springs
.115 Couplings
.116 Brakes
.117 Furnishings
.118 Sanitation, Heating, Lighting, Ventilation
.12 Passenger Cars
.13 Baggage and Mail Cars
.14 Freight Cars
.15 Work Cars
Motor Cars (*See* 136.6)
.2 Locomotives (Put here Manuals for Locomotive Engineers and Firemen. *See also* Electric Locomotives, 136.5)

135 **Rolling Stock** (*Continued*)
.21 Design and Construction
.22 Details (Frames, Boilers, etc. Divide if necessary)
.23 Types
.24 Locomotive Tenders
.25 Locomotive Shops and Works
.26 Locomotive Maintenance and Repair. Inspection
.27 Locomotive Performance
136 **Use of Electricity. General Works on Electric Railroads**
.1 Power Requirements. Sub-Stations (For Power Plants, *See* 321, Electric Plants, under Electrical Engineering)
.2 Power Transmission
.21 Overhead Trolley Systems
.22 Third-Rail Systems
.23 Other Systems
.3 Track } Material to be classed here only when differing in
.4 Cars } construction from ordinary track and cars
.5 Electric Locomotives
.6 Railway Motor Cars
.7 Rolling Stock Accessories and Parts
.71 Motors, Controllers, etc.
.8 Locomotive and Car Wiring
137 **Operation**
.1 Signals and Signaling
.11 Hand Signals
.12 Telegraph and Telephone Systems
.13 Block Systems
.14 Interlocking Systems
.2 Train Movement
.21 Train Resistance
.22 Train Speed
.23 Train Load
.24 Train Running
.241 Travelers' Guides. Time-Tables
.3 Railroad Accidents. Safety Measures
.4 Traffic
.41 Station Management
.42 Passenger Traffic
.43 Baggage
.44 Express
.45 Mail Service
.46 Freight
.5 Rates
.51 Passenger Tariffs
.52 Freight Tariffs
.6 Finance
.61 Capitalization
.62 Valuation
.63 Accounting
.64 Receivership and Reorganization
.65 Clearing House
.7 Organization of Staff and Force
.71 Service Rules and Regulations
.72 Wages
.73 Strikes
.8 Federal and State Relations
138 **Reports**
.1 Company Reports
.2 State Commission Reports (Enter here only serials or reports so general in nature that they cannot be classed elsewhere)
.3 Government Reports (Above note applies also to this class)
139 **Miscellaneous Kinds of Railways**
.1 Mountain
.11 Cable
.12 Rack
.2 Monorail
.3 Aerial Tramways
.4 Industrial Railways
.5 Ship Railways
140 **Street Railways. Elevated Railways. Subways**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates

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283 **Wind Power**
.1 Windmills

300 **ELECTRICAL ENGINEERING**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
306 **Induction Coil**
308 **Economics**
.1 Rates
.2 Valuation
.3 Contracting
309 **Electric Utilities. Reports of Companies**
310 **Electric Measurement**
311 **Units and Standards**
312 **Meters**
.1 Ammeter
.2 Voltmeter
.3 Ohmmeter
.4 Watt-meter
.5 Coulometer
.6 Potentiometer
.7 Galvanometer
.8 Wheatstone Bridge. Slide-Wire Bridge
.9 Other Meters
313 **Current Measurement**
314 **Power Measurement**
315 **Resistance Measurement**
316 **Potential Measurement**
317 **Capacity Measurement**
318 **Inductance Measurement**
319 **Other Measurements**
320 **Dynamo-Electric Machinery. Transformers. Central Stations**
.1 Armature and Field Windings
321 **Electric Plants. Central Stations.** (For Hydro-Electric Plants, *See* 181, under Water Power)
.1 Steam Driven
.2 Gas Driven
.3 Oil Driven
.4 Operation and Management
.41 Maintenance
.42 Rates
.43 Finance
.44 Valuation
.45 Accounting

322 **Direct Currents and Machines**
.1 Generators
.2 Motors
.3 Dynamotors
.4 Direct-Current Boosters
323 **Alternating Currents and Machines**
.1 Synchronous Machines
Generators
.11 Motors
.12 Converters (Rotary Converters)
.13 Asynchronous Machines. Induction Machines
.2 Induction Generators
.21 Single-Phase
.211 Three-Phase
.212 Induction Motors
.22 Single-Phase
.221 Polyphase
.222 Motor-Converters
.3 Alternating-Current Commutator Motors
.4 Series Motors
.41 Repulsion Motors
.42 **Double-Current Generators**
324 **Motor Generators**
325 **Rectifying Apparatus**
326 **Stationary Induction Apparatus**
327 Transformers
.1 Auto-Transformers. Compensators
.2 Potential Regulators
.3 Reactors or Reactance Coils
.4 **Electrostatic Apparatus**
328 Condensers
.1 **Control Devices. Switches and Switch-boards**
330 **Switches**
331 **Switch-boards. Panels**
332 **Controllers. Rheostats**
333 **Wireless Control**
338 **Protective Devices**
339 Fuses
.1 Circuit Breakers
.2 Reactances
.3 Lightning Protection
.4 **Transmission. Distribution**
340 **Systems. Line Phenomena**
341 Direct Current
.1 Alternating Current
.2 **Transmission Materials**
342 Wire
.1 Cables
.2 Insulators
.3 **Overhead Lines**
343 Design of Overhead Lines. Catenary. Stresses. Wind Pressure
.1 Poles
.2 Towers
.3 Accessories. Cross-Arms. Pins
.4 **Underground Lines**
344 **Electric Wiring**
345 **Telephone**
350 **Line Transmission**
351 **Systems**
352 **Instruments**
353 Transmitter
.1 Receiver
.2 **Switch-boards and Other Station Equipment**
354 **Wireless Telephony**
357 **Operation. Rates**
358 **Telephone Companies. Reports**
359 **Telegraph**
360 **Line Transmission**
361 **Instruments**
362 **Systems. Codes**
363 Morse
.1 Hughes
.2 Simplex
.3 Multiplex
.4 **Printing Telegraphy**
364 **Picture Telegraphy**
365

366 **Submarine Cable Telegraphy**
367 **Wireless Telegraphy**
368 **Operation. Rates**
369 **Companies. Reports**
370 **Electric Lighting**
371 **Illumination**
.1 Interior
.2 Exterior. Streets, Parks, etc.
372 **Electric Lamps**
.1 Arc Lamps
.11 Carbon
.12 Mineralized
.13 Vapor
.2 Incandescent Filament Lamps
.21 Carbon and Carbon Metallized
.22 Metal
.23 Other
373 **Electric Light Plants for Country Houses, etc.**
374 **Special Uses of Electric Light**
.1 Searchlights
.2 Signs
380 **Chemical Electricity. Batteries**
381 **Primary Cells**
382 **Storage Batteries. Accumulators**
383 **Lead Accumulators**
390 **Other Uses of Electricity**
391 **Industrial**
.1 Electric Drive
Elevators, Cranes (*See* 260, under Mechanical Engineering)
392 **Domestic**
393 **Therapeutic**
394 **Agricultural**
Mining (*See* 470, under Mining Engineering)

400 **MINING ENGINEERING**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
408 **Economics. Mine Accounting**
409 **Organization and Administration**
.1 Mine Labor
.2 Reports of Mine Departments and Inspectors
410 **Prospecting. Mine Surveying**
411 **Prospecting**
.1 Divining Rod
412 **Mine Surveying**
413 **Mine Models**
414 **Sampling**
415 **Valuation**
416 **Prospectuses**
420 **Excavation and Working**
421 **Open Working**
.1 Placer Mining
.11 Working with Pan
.12 Sluicing
.13 Hydraulic Mining
.14 Dredging
422 **Drilling. Blasting**
.1 Explosives
423 **Quarrying**
424 **Boring**
425 **Shaft Sinking**
.1 Shaft Lining
426 **Tunneling and Drifting**
427 **Stoping**
428 **Timbering and Mine Supports. Masonry Lining**
430 **Drainage and Sanitation**
431 **Mine Waters**

432 **Mine Pumps**
433 **Mine Dams**
434 **Sanitation**
440 **Transportation. Haulage and Hoisting**
441 **Underground Haulage**
442 **Mine Locomotives**
443 **Hoisting**
.1 Hoisting Engines
.2 Cages. Skips. Buckets
444 **Surface Transportation**
445 **Storage** (*See also* 117.52, Coal Storage Plants, under Building Construction)
450 **Ventilation**
451 **Mine Gases. Fire-damp.**
460 **Lighting. Signaling**
461 **Safety Lamps**
462 **Signals and Signaling**
470 **Electricity in Mining**
480 **Accidents. Safety Measures and First Aid**
481 **Explosives**
.1 Dust Explosions
482 **Mine Fires**
483 **Safety Regulations**
484 **Mine Rescue Work. First Aid**
490 **Mining of Special Kinds of Ore**
491 **Coal Mining**
492 **Copper Mining**
493 **Gold and Silver Mining**
494 **Iron Mining**
495 **Lead Mining**
496 **Petroleum Mining**
497 **Tin Mining**
498 **Zinc Mining**
499 **Miscellaneous** (Arranged Alphabetically by Metal, *e. g.*, Antimony, Cadmium, Cobalt, etc.)

500 **METALLURGY**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
501 **Physics and Chemistry of Metals. Metallography**
502 **Alloys**
503 **Ore Dressing. Milling of Ore** (*See also* under each Metal)
.1 Crushing, Grinding etc.
.2 Concentration. Sizing. Sorting
.21 Flotation
.3 Amalgamation
.4 Cyanide Process
504 **Pyro-metallurgy** (General)
.1 Fuel (*See also* 222.2, Fuel, under Mechanical Engineering)
.2 Refractory Materials
.3 Furnaces
.4 Gases
.5 Smelting
505 **Hydro-metallurgy** (General)
506 **Electro-metallurgy** (General)
508 **Economics. Trade**
509 **Reports**
510 **Iron and Steel**
.1 Physics and Chemistry. Metallography
.2 Alloys
511 **Ore Dressing**
513 **Pyro-metallurgy**
.1 Pig Iron Manufacture
.3 Cementation Process
.4 Crucible Process
.5 Bessemer Process
.6 Open-Hearth Process

514 **Electro-metallurgy**
515 **Foundries and Foundry Practice**
516 **Mechanical Treatment of Iron and Steel**
.1 Forging
.2 Rolling Mills
517 **Heat Treatment of Iron and Steel**
.1 Improper Heating of Steel
.11 Welding
.2 Hardening
.21 Case Hardening
518 **Economics. Iron and Steel Trade**
519 **Descriptions and Reports of Iron and Steel Works**
520 **Gold and Silver**
.1 Physics and Chemistry
.2 Alloys
521 **Ore Dressing. Milling of Ore**
.1 Crushing. Grinding
.2 Flotation
.3 Concentration. Sizing. Sorting
.4 Amalgamation
.5 Cyanide Process
522 **Roasting**
523 **Hydro-metallurgy**
524 **Electro-metallurgy**
528 **Economics. Trade**
529 **Reports**
530 **Copper**
.1 Physics and Chemistry. Metallography
.2 Alloys
531 **Ore Dressing**
.1 Crushing. Grinding
.2 Flotation
.3 Concentration. Sizing. Sorting
.4 Amalgamation
.5 Cyanide Process
532 **Pyro-metallurgy**
.1 Roasting
.2 Smelting
.3 Bessemer Process
532 **Hydro-metallurgy**
533 **Electro-metallurgy**
538 **Economics. Copper Trade**
539 **Reports**
540 **Lead**
550 **Tin**
560 **Zinc**
580 **Other Metals** (Arranged Alphabetically)
590 **Assaying**

600 **GAS ENGINEERING**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
610 **Natural Gas**
611 **Fields**
612 **Production**
.1 Wells
613 **Transmission**
.1 Pumping Plants
.2 Pipe Lines (For Local Distribution, *See* 650)
620 **Materials for Gas Manufacture**
630 **Manufacture and Works**
631 **Coal Gas**
.1 Purification
632 **Water Gas**
.1 Purification
633 **Producer Gas**
634 **Coke Oven Gas**

635 **Oil Gas**
636 **Acetylene**
637 **Air Gas**
639 **Other Processes**
640 **Storage**
641 **Station Meters**
642 **Holders**
643 **Analysis and Testing**
650 **Distribution**
651 **Station Governors**
652 **Pressure Instruments and Apparatus**
653 **Pumping Plants**
654 **Flow in Pipes**
655 **Street Mains**
.1 Valves
.2 Subways
656 **Service Pipes**
657 **Interior Piping and Fittings**
.1 Regulators
.2 Consumers' Meters
.3 Piping
660 **Utilization**
661 **Gas Lighting**
.1 Illumination
.11 Interior
.12 Exterior. Streets. Parks, etc.
.2 Gas Lamps
.21 Burners
.22 Incandescent Fixtures
662 **Gas Heating**
670 **By Products**
671 **Coke**
672 **Tar**
673 **Ammonia**
674 **Sulphur**
675 **Cyanogen**
676 **Naphthalene**
677 **Benzol**
679 **Other Products**
680 **Management**
.1 Maintenance
.2 Rates
.3 Finance
.4 Valuation
.5 Accounting

700 **CHEMICAL TECHNOLOGY AND MANUFACTURES**
General
.01 History
.02 Laws and Legislation
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.08 Exhibitions
.09 Tests. Laboratories
710 **Chemicals. Dyes. Paints and Varnishes**
711 **Chemicals**
.1 Chemical Elements
.2 Acids
.21 Nitric Acid
.211 Utilization of Atmospheric Nitrogen
.22 Sulphuric Acid
.3 Alkalies
.4 Salts (For Common Table Salt, *See* 785, Salt, under Foods and Beverages)
712 **Paint, Varnish, etc.**
713 **Dyes. Colors. Inks**
714 **Distillation Products**
.1 Wood Distillation
.2 Coal Distillation (*See* Gas Engineering)
715 **Explosives. Matches** (*See also* 831, Explosives, under Military and Naval Science)
716 **Starch, Glucose, Gluten, etc.**

717 **Photographers' Supplies**
719 **Miscellaneous Organic Chemical Industries**
.1 Vegetable and Animal Oils
.2 Soap, Perfumery, etc.
.3 Glycerine
.4 Candles
.5 Waxes
.6 Gums and Resins
.7 Glue and Gelatine
.8 Fertilizers
720 **Ceramics. Stone, Clay, and Glass. Other Non-Metallic Mineral Products.**
721 **Ceramics**
.1 Pottery
.2 Stoneware. China
.3 Sanitary Ware
.4 Electrical Porcelain
.5 Brick
.6 Terra Cotta
.9 Other Clay Products
722 **Glass Manufacture**
723 **Cement, Lime, and Gypsum**
724 **Stone Products. Artificial Stone**
725 **Abrasives**
726 **Asphalt and Other Bitumens**
727 **Petroleum**
.1 Lubricants (*See also* 204, Lubrication, under Mechanical Engineering)
729 **Miscellaneous Non-Metallic Mineral Products**
.1 Asbestos
730 **Metal Manufactures. Machinery. Conveyances**
731 **Gold and Silver Ware. Jewelry**
732 **Iron and Steel Articles** (Not Classified Elsewhere)
733 **Wire Making**
734 **Hardware, Cutlery, and Tools**
735 **Implements. Instruments** (Not Classified Elsewhere)
.1 Typewriters
.2 Cash Registers
.3 Scales
.4 Meters
.5 Watches and Clocks
736 **Machinery.** (Not Classified Elsewhere)
737 **Locksmithing. Gunsmithing**
738 **Vehicles. Conveyances**
.1 Carriages, Wagons, and Sleighs
Automobiles and Motor Trucks (*See* 230)
.2 Bicycles
Manufactures of Miscellaneous Metals (Arranged Alphabetically, *e. g.*, Aluminum, Bronze, Copper, Tin, etc.)
740 **Lumbering. Wood Manufactures**
741 **Logging. Lumbering**
742 **Wood Working. Saw Mills**
743 **Furniture**
.1 House Furniture
.2 Office Furniture
.3 Pianos and Musical Instruments
.4 Mirrors
744 **Cooperage**
745 **Box Making**
746 **Caskets. Undertakers' Supplies**
747 **Pulp and Fiber Goods**
.1 Mats. Baskets
.2 Brooms
.3 Brushes
748 **Cork Industries**
749 **Miscellaneous Wooden Articles**
750 **Paper Making**
760 **Textiles**
.1 Design
.2 Processes
.21 Spinning
.22 Weaving
.23 Dyeing and Finishing
.3 Machinery
761 **Cotton Manufactures**
762 **Woolen Manufactures**

763 **Silk Manufactures**
764 **Flax, Hemp, and Jute**
765 **Dry Goods**
766 **Carpets and Rugs**
767 **Felt**
768 **Cordage and Twine**
769 **Oil Cloth. Window Shades**
770 **Leather Manufactures. Tanning**
771 **Boots and Shoes**
772 **Harnesses. Saddlery**
773 **Trunks. Traveling Goods**
774 **Fur**
779 **Miscellaneous Leather Goods**
780 **Foods and Beverages**
781 **Flour, Feed, and Other Cereal Products**
782 **Sugar and Molasses**
783 **Canning Industries**
784 **Chocolate and Cocoa**
785 **Salt**
786 **Groceries** (Not Otherwise Classified)
787 **Slaughtering. Meat Packing**
788 **Dairy Products**
.1 Milk and Cream
.2 Butter
.3 Cheese
.4 Ice Cream
.5 Casein
789 **Wines and Liquors**
.1 Brewing and Malting. Beer
.2 Wine Making
.3 Distilled Liquors
790 **Miscellaneous Industries** (Arranged Alphabetically, *e. g.*, Celluloid Products, Laundering, Rubber, Tobacco)

800 **MILITARY AND NAVAL SCIENCE**
General
.01 History
.02 Laws
.03 Statistics
.04 Costs and Estimates
.05 Contracts and Specifications
.06 Drawings
.07 Congresses
.09 Tests. Laboratories
810 **Military Science, General Works**
811 **Strategy and Tactics**
812 **Army Organization and Administration**
820 **Fortifications**
830 **Ordnance (Military and Naval)**
831 **Explosives**
832 **Military Ordnance**
833 **Naval Ordnance**
840 **Naval Architecture. Shipbuilding.**
.1 Buoyancy and Displacement
.2 Resistance
.3 Stability
.4 Strength of Ships
.5 Structural Details
.51 Water-tight Compartments
.6 Ventilation and Heating
.8 Measurement of Ships
.9 Miscellaneous Equipment of Ships
.91 Steering Apparatus
.92 Distillation of Salt Water
841 **Materials**
842 **Ship Propulsion. Propellers**
.1 Steam
.2 Electric
843 **Special Types of Vessels** (*See also* 870, War Vessels, under Naval Science)
.1 Ocean Liners
.2 River and Lake Boats
.3 Vessels for Freight only
.31 Oil Steamers. Tank Ships
.32 Colliers
.33 Ore Ships

843 **Special Types of Vessels** (*Continued*)
.4 Canal Boats. Barges
.5 Tugboats
.6 Motor Boats and Launches
.7 Yachts. Pleasure Boats
.8 Survey Boats
.9 Other Types
850 **Yards**
851 **Dry Docks**
860 **Navigation. Shipping**
861 **Nautical Astronomy**
862 **Nautical Instruments**
.1 Compass
.11 Magnetism of Ships and Compass Variation
863 **Seamanship**
864 **Aids to Navigation**
.1 Tide Tables
.2 Charts
.3 Sailing Directions
.4 Steam Lanes
.5 Signals and other Maritime Regulations. Prevention of Collisions
.51 Signals
.511 Lighthouses
.512 Light Ships
.513 Buoys
.514 Fog Horns
.52 Marking of Ships
.53 Flags and Pennants
.54 Steering and Sailing Rules
.55 Loading Rules
.6 Pilotage and Pilots
865 **Shipwrecks. Accidents**
.1 Life Saving
.2 Salvage
866 **Shipping. Merchant Marine**
.1 Directories, Blue Books, etc.
.2 Companies
.3 Rates
.4 Tolls
.5 Accounts
.9 Inspection
870 **Naval Science. War Vessels**
871 **Battle Ships and Cruisers**
872 **Torpedo Boats**
873 **Torpedoes**
874 **Submarines**
875 **Armor Plate**
876 **Armament**
880 **Naval Strategy and Tactics**
890 **Naval Organization and Administration**
891 **Registers.**
892 **Navy Customs. Rank of Officers**
893 **Personnel**
.1 Naval Militia
.2 Marines
894 **Education**
895 **Maintenance and Supplies**
896 **Hygiene**

900 **OTHER SUBJECTS**
Note: For subdivisions, use Dewey Classification.
910 **Philosophy**
920 **Religion**
930 **Sociology**
940 **Philology**
950 **Natural Science**
960 **Useful Arts** (Other than Engineering and Manufactures)
970 **Fine Arts**
980 **Literature**
990 **History**

APPENDIX C

AMENDMENTS TO THE CONSTITUTION, AMERICAN SOCIETY OF CIVIL ENGINEERS, ADOPTED, 1891–1917.

Oct. 3, 1894 (*Proceedings*, Vol. XX, p. 176.)	Art. II, Sec. 1, 2. Art. III, Sec. 6, 7. Art. IV, Sec. 1, 2, 3, 7.	Abolishes Grade of "Subscribers."	Yes, 194 No, 5
	Art. II, Sec. 8.	Corporate Members may become Fellows. Previous to this time the grade of Fellows was limited to "contributors to the permanent funds of the Society who may not be eligible for admission as Corporate Members."	Yes, 196 No, 3
	Art. III, Sec. 1.	Honorary Members "shall be elected only by the unanimous vote of the Board of Direction" instead of "by a unanimous vote of the Board of Direction and such Past-Presidents of the Society as continue to be members of the Society", etc., the Past-Presidents having become members of the Board of Direction on the adoption of the Constitution.	Yes, 196 No, 5
	Art. III, Sec. 2.	Applicants for membership must be endorsed by written communications from five Corporate Members before applications can be considered by the Board of Direction.	Yes, 193 No, 7
	Art. VI, Sec. 4.	This Amendment provided that the Secretary be a Corporate Member of the Society and be elected annually by the majority of the whole Board of Direction within twenty days after the Annual Meeting.	Yes, 191 No, 6
Mar. 3, 1895 (*Proceedings*, Vol. XXI, p. 85.)	Art. III, Sec. 3.	This Amendment required the Preliminary List of applicants to contain the names of "references" for Corporate Members and "endorsers" for Associates, Juniors, and Fellows, in order to make the meaning in Section 2 of this Article clearer.	Yes, 265 No, 14
	Art. III, Sec. 5.	This Amendment required that ballots on reconsideration of rejected applications for membership must be signed by the voters.	Yes, 224 No, 61
	Art. VII.	The territory occupied by the Membership was divided into Seven Geographical Districts, thus dividing the non-resident members of the Board of Direction equally among the six non-resident Districts. This amendment increased the elective members of the Nominating Committee from seven to fourteen, who, with the five living Past-Presidents, should nominate officers for the Society; made the term of each member two years; and empowered the Board of Direction to prescribe the mode of procedure in the election of members of the Nominating Committee.	Yes, 273 No, 12
	Art. VI, Sec. 5.	This Amendment provided for the appointment of an Assistant Secretary by the Board of Direction.	Yes, 273 No, 7

Oct. 6, 1897 (*Proceedings*, Vol. XXIII, p. 164.)	Art. V, Sec. 1.	This Amendment provided that only the "five latest living Past-Presidents who continue to be members" shall be members of the Board of Direction, instead of "all the living Past-Presidents", as previously provided. In the case of the election of Honorary Members, however, all the Past-Presidents shall be members of the Board of Direction.	Yes, 427 No, 47
Oct. 5, 1898 (*Proceedings*, Vol. XXIV, pp. 121, 167.)	Art. VI.	The office of Auditor was abolished and his duties were transferred to the Secretary; provision was made for auditing the accounts of the Society monthly, and the duties of the Finance Committee were widened, in order that the immediate supervision of the financial affairs of the Society might be put into the hands of such Committee.	Yes, 210 No, 1
Oct. 3, 1900 (*Proceedings*, Vol. XXVI, p. 216.)	Art VII, Sec. 2.	The time of appointing the Nominating Committee was changed from the Annual Convention to the Annual Meeting, and the time was fixed for the meeting of such Committee and its presentation to the Board of Direction of the nominations for officers to be elected at the next Annual Meeting.	Yes, 193 No, 53
Mar. 4, 1903 (*Proceedings*, Vol. XXIX, pp. 36, 100.)	Art. III, Sec. 2, 3.	This Amendment provided that hereafter the Board of Direction shall classify the applicant with his consent.	Yes, 401 No, 26
Oct. 7, 1903 (*Proceedings*, Vol. XXIX, pp. 195, 374.)	Art. II, Sec. 6, 7, 8.	By this Amendment provision was made for the omission of the clause, in the case of application for Junior membership, stating that the applicant intends to become or continue to be an engineer.	
	Art. III.	By this Amendment all applications are to be sent out as applications for "admission" to the Society without classification into grades; power is given the Board of Direction to transfer persons from a lower to a higher grade; the number of negative votes for exclusion is raised from seven to twenty; and the reconsideration ballot (pink ballot) is abolished.	Yes, 537 No, 49
Oct. 7, 1908 (*Proceedings*, Vol. XXXIV, p. 408.)	Art. III, Sec. 1, 3, 4.	The election and transfer of applicants in any grade is taken from the membership at large and given to the Board of Direction, the consequent changes in method of election are fixed, and the number of negative votes for exclusion is changed from "20 or more" to "3 or more".	Yes, 892 No, 317
	Art. VI, Sec. 12.	This Amendment confers on the Board of Direction the power of appointing a Special Committee when such appointment is approved by a business meeting of the Society; and, if it is necessary, in the opinion of the Board, that such Committee be appointed in order to accomplish the objects for which its appointment is requested.	Yes, 1123 No, 58
	Art. VII, Sec. 2.	Power is given the Board of Direction to fill any vacancies occurring in the Nominating Committee.	
Mar. 1, 1911 (*Proceedings*, Vol. XXXVII, p. 164.)	Art. IV,	A new Section (13) is added to Article IV by this Amendment, which provides for exemption from dues of Corporate Members and Associates who have reached the age of seventy years, and have paid dues as such for twenty-five years, and also of Corporate Members and Associates who have paid dues as such for thirty-five years.	Yes, 2229 No, 39

Oct. 2, 1912 (*Proceedings*, Vol. XXXVIII, p. 550.)	Art. VII,	By this Amendment the number constituting a quorum at a meeting of the Nominating Committee is fixed at ten; the time of meeting of the Nominating Committee is fixed to take place either at the Annual Convention or not later than July 15; provision is made for the organization of the Nominating Committee; "Official Nominees" and "Nomination by Declaration" are established; nomination by the Board of Direction is provided for, in case the Nominating Committee fails to act; and the time of closing the polls at the Annual Election is changed from noon to 9 A. M.	Yes, 680 No, 31
Mar. 3, 1915 (*Proceedings*, Vol. XLI, p. 150.)	Art. VII, Sec. 1.	The territory occupied by the membership is divided into Thirteen Districts instead of seven, as heretofore.	Yes, 1066 No, 83
	Art. VII, Sec. 2.	This Amendment provides for the method of electing the Nominating Committee from thirteen districts instead of seven.	

AMENDMENTS TO CONSTITUTION, AM. SOC. C. E.
REJECTED, 1891–1917.

Mar. 6, 1901 (*Proceedings*, Vol. XXVII, pp. 38, 82.)	Art. II, Sec. 5.	It was proposed by this Amendment to add a clause to Section 5, Article II in order to allow the Board of Direction to transfer any Junior elected prior to the adoption of the Constitution in 1891 to the grade of Associate.	Yes, 282 No, 166
Mar. 5, 1902 (*Proceedings*, Vol. XXVIII, pp. 35, 98.)	Art. III,	This Amendment, if adopted, would have placed the election of all members in the hands of the Board of Direction.	Yes, 343 No, 257
Mar. 6, 1907 (*Proceedings*, Vol. XXXIII, pp. 71, 152.)	Art. II.	It was proposed by this Amendment to raise the standard of membership in the Society by raising the qualifications for admission to the various grades.	Yes, 429 No, 847
	Art. III, Sec. 2.	This Amendment related to applications of engineers not resident in North America and provided that the applicant must possess the necessary qualifications for membership before he is recommended for election to the Society.	
Mar. 3, 1909 (*Proceedings*, Vol. XXXV, p. 160.)	Art. III, Sec. 4.	This Amendment provided that negative votes equal to 1%, or the whole number nearest to 1%, of the total Corporate Membership at the time of voting shall exclude from membership. This Amendment was nullified by the Amendment adopted on Oct. 7th, 1908, and was, therefore, defeated.	Yes, 247 No, 762
Mar. 4, 1914 (*Proceedings*, Vol. XL, p. 176.)	Art. VII, Sec. 1, 2.	(A) By this Amendment, it was proposed to divide the territory occupied by the membership into Thirteen Districts; it also provided for the procedure in appointing the Nominating Committee from such Districts at the Annual Meeting.	Yes, 1494 No, 1628
	Art. VII,	(B) This Amendment also provided for dividing the territory occupied by the membership into Thirteen Districts and the method of procedure of electing the Nominating Committee by ballot to be counted by the Board of Direction and announced to the Annual Meeting.	Yes, 1550 No, 1612

Art. V, Sec. 1, 2.	(C) By this Amendment, it was proposed to change the status of the Secretary by removing him as a member of the Board of Direction. It also defined the terms of officers elected by the Society.	Yes, 1343
Art. VI, Sec. 4, 6.	The changes proposed in this Amendment relate to the method of electing the Secretary by the Board of Direction and would have given the Board of Direction power to determine the salaries to be paid to the Secretary and Treasurer.	No, 1828

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